NIPRO

MAINTENANCE MANUAL

SINGLE PATIENT DIALYSIS MACHINE

DIAMAX

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1 APPLICATION

(a) Single patient dialysis machine, DIAMAX is applied to treatment of patients with acute or chronic renal failure by dialysis when doctors instruct the application.

(b) DIAMAX can be used in a controlled environment such as a place in a hospital.

2 CONTRAINDICATION

Any application other than dialysis using DIAMAX is contraindicated.

3 PRECAUTIONS

Service life of this machine is 6 years.

3.1. Equipment Classification and Handling precautions

This machine is classified as follows:

Type of protection from electric shock ·····Class Ⅰ

Degree of protection from electric shock ·····Type B

Ensure to have a protective earth connection with the equipped power plug.

3.2. Precaution for Fluid Penetration

Keep the machine out of water.

3.3. Precaution for Flammable Atmospheres

Do not use this machine in flammable atmospheres.

3.4. Safety Precautions

Appropriate operation and regular maintenance are essential for safer use of this machine. Carefully read and thoroughly understand the safety precautions described in this manual before using or servicing this machine.

The operating procedures and precautions described in this manual are effective only when this machine is used for its intended purposes. Users shall be liable for all deeds and the safety measures taken when the machine is used in methods other than specified in this manual.

1. Degree of damage to health and property, and its indication (Alert symbols and signal words)

The degree of the foreseeable damage to health and property when the machine is misused is classified into the following three categories, and each category is expressed by the following alert symbol and signal word.

⚠ DANGER

Indicates an imminent hazardous situation which, if the machine is misused, will result in death or serious injury.

⚠ WARNING

Indicates a potentially hazardous situation which, if the machine is misused, will result in death or serious injury.

⚠ CAUTION

Indicates a potentially hazardous situation which, if the machine is misused, may result in minor or moderate injury or property damage.

2. Note and its indication

NOTE

Indicates note sentences. Make reference when operating or servicing the machine.

⚠ DANGER

■ Before using the machine, be sure to read this manual.

- This machine operates in a safe and reliable manner when operated and serviced as specified in this manual.
- Carefully read and thoroughly understand this manual before operating this machine. Incorrect operation may endanger individual person or damage the machine.
- This machine shall be operated by trained qualified personnel at a hospital under the supervision by a doctor.

■ Know the method to stop this machine immediately.

- Know the method to stop this machine immediately in order to prevent the occurrence of serious troubles.
- Do not allow non-professionals to operate the unit without having proper instructions.

■ Know the measures to take in case when this machine has stopped due to some troubles.

- Check the condition of the machine and take appropriate measures according to the instructions described in this manual.

■ Do not touch any printed wiring boards, electric wiring, and terminals except when servicing this machine.

- Do not touch any electric wiring and terminals not isolated.
- Do not touch any printed wiring boards with wet hands.
- Turn OFF the breaker when touching a printed wiring board, electric wiring, or terminals.

■ Take special caution on the following foreseeable risk of danger to a patient when he or she is connected to or disconnected from the line of the machine for medical treatment.

- Air must not enter the body of a patient.
- Do not connect a patient to the blood line before priming.
- Do not connect a patient to the blood line when this machine is being rinsed.
- Take caution so that any harmful viruses or chemicals do not enter the body of a patient.

■ Always confirm that a patient is appropriately connected to the blood line. Improper connection to the blood line may endanger a patient by the blood leak due to the poor connection, rupture of the blood line due to inappropriate pressure rise, etc.

⚠ WARNING

■ Do not change any set values during a treatment except for the case in emergency.

- Change set values before connecting a patient.
- When making a setting for a function, thoroughly understand the function to use in advance.

■ Take caution to keep the power cable off the floor to prevent an electric shock due to the leaked water on the floor when this machine is defected.

■ Furnish drainage near this machine.

■ Be sure to read maintenance manual before servicing the machine.

- Read carefully and thoroughly understand maintenance manual before servicing the machine.
- Service the machine according to the instructions described in the maintenance manual.
- Ask special maintenance personnel for the maintenance other than specified in the maintenance manual.

■ Do not operate any switches unnecessarily during dialysis treatment.

■ Do not tilt the machine by five (5) degrees or more under the conditions where something is put on the disinfectant tank table, hanger, tray, etc. Otherwise, the machine may fall.

■ Do not put anything on the disinfectant tank table, hanger, tray, etc when moving the machine.

■ Do not tilt the machine by ten (10) degrees or more. Otherwise, the machine may fall.

■ Do not connect any equipment other than allowed with this machine.
(Total leakage current (of this machine and other connected equipment) may exceed the allowable value).

■ Usages other than specified by the manufacturer may cause injury or death of a patient. The manufacturer will not liable for any troubles including damage to health of a patient if this machine is operated, serviced, or calibrated in a manner other than specified by the manufacturer. Only a trained qualified person must operate this machine in the method specified by the manufacturer.

■ Check the real concentration by the Laboratory.

- Confirm that the real concentration is correct, using an osmotic pressure meter, a conductivity meter, a flame photometer, etc.
- Confirm that the conductivity displayed on the machine is correct.

■ Confirm neither disinfectant nor acid fluid remains after rinsing is complete.

- After disinfection by sodium hypochloride or peracetic acid or acid cleaning by acetic

acids is complete, confirm neither disinfectant nor acidic fluid remains in the fluid supply part and drainage part using test papers or reagent.

⚠ CAUTION

■ Read and understand the installation procedures described in the maintenance manual before installing this machine.

- Only the person who was trained qualified personnel must install this machine.

■ Read and understand the instruction manual of optional parts before connecting such optional parts to this machine.

- Only the person who was trained qualified personnel must install this machine.

■ Do not give strong force or shock to the display and operation panel.

- Take caution not to give strong force or shock to the display and operation panel during cleaning.

■ Sufficiently disinfect the machine before using it.

- Rinse the machine for one hour or longer when it has not been used for a long period of time.
- When using the machine that has not been used for a long period of time without draining, clean it until clean water comes out from the drain outlet.

■ Be sure to always keep the machine clean.

- Wipe off droplets and stains of blood, dialysate, cleaning solution as soon as possible.
- Perform rinsing and disinfection regularly.

■ Some processes do not accept specific switches. In such cases, do not operate switches forcedly.

■ Be sure to use the dialysate concentrate in properly color-coded container. The dialysate concentrate not contained in a color-coded container cannot be used with this machine.

■ Use only disposable products affixed with CE marking.

■ A person who handles disposable products may touch hepatitis virus or other infectious medicals. Take extreme caution not to be infected when operating this machine.

■ Assure the quality of water, dialysate concentrate, and substitution fluid used for the machine operation in order to secure performance and safety.

3.5. Precautions

1. Allow only skilled personnel to operate the machine.
2. Take caution on the following points when installing the machine.
   1) Install at a place where water does not splash on the machine.
   2) Install at a place where the machine does not receive adverse effect from the atmospheric pressure, temperature, humidity, ventilation, sunlight, and atmosphere that includes dust, salty, sulfur, etc.
   3) Take caution on the stability of the machine not to give it inclination, vibration, and shocks (including the time of transportation).
   4) Avoid a storage of chemicals or a place where gases are generated.
   5) Pay attention to the frequency, voltage, and permissible current (or power consumption) of the power supply.
   6) Check the state of the power supply (state of the electrical discharge, polarity, etc.).
   7) Connect the earth properly.
3. Take caution on the following points before using the machine.
   1) Check the conditions of switch contacts and verify that the machine operates properly.
   2) Confirm the grounding is ensured.
   3) Confirm that all the cable connections are correct and safe.
   4) Take sufficient caution when using the machine in combination with other machines since it may obstruct correct operation or cause danger.
   5) Verify that there is neither deforming nor discoloration in the appearance and other features of the machine.
4) Take caution on the following points when using the machine.
   1) Always observe that there is no abnormality in the operation of the machine and with a patient.
   2) If some abnormality has occurred with the machine, take appropriate measures such as stopping the machine in a safe condition for the patient.
   3) Do not raise the dialysate pressure above the allowable limit.
   4) Take caution so that a patient does not touch the machine.
   5) Do not give any strong vibration to the machine.
   6) Do not bring any electromagnetic wave source close to the machine since it may cause a breakdown or malfunction of the machine.
5. Take caution on the following points after using the machine.
   1) Turn OFF the power supply of the machine to return the machine to the condition before use according to the specified procedures.
   2) Do not give unnecessary force in pulling the power and other cables for disconnection, but hold the plug.
   3) Take caution on the following points for the storage of the machine.
      a. Keep at a place where no water splashes on the machine.

b. Keep at a place where the machine does not receive adverse effect from the atmospheric pressure, temperature, humidity, ventilation, sunlight, and atmosphere that includes dust, salty, sulfur, etc.
c. Take caution on the stability of the machine not to give it inclination, vibration, and shocks (including the time of transportation).
d. Avoid storage of chemicals at a place where gases are generated.

4) Put away the accessories, cables, and electrode, etc. together at an appointed place after cleaning.
5) Always rinse and clean the machine after use to prepare for the next use.
6) Always keep the filter of the cooling fan clean.

6. If the machine is defected, check the trouble cause on the appropriate display and ask the special maintenance personnel for repair without fiddling it by yourself.
7. Do not modify the machine.
8. Maintenance
   1) Make the special maintenance personnel check the machine and its parts periodically.
   2) Confirm that the machine operates properly and safely when operating the machine that has not been used for a certain period of time.
9. Others
   1) Check the concentration of the dialysate before use by the osmotic pressure measurement method and the like.
   2) (Concerning the water to dilute the dialysate concentrate:) AAMI standards water is recommended for the water to dilute the dialysate concentrate used for the chronic dialysis treatment.

3.6. Precaution for Software

The Version number of manuals is described on the front cover of each document.
These documents are corresponded with this software version. Please check the list below for compliance with the software version and these documents before usage.
You can check the software version in the start-up screen.

Documents / Version		Software Version
Instruction Manual	PrCMX1001-0606	Ver. CE 00
Maintenance Manual	PrCMX2001-0606	
Troubleshooting Manual	PrCMX3001-0606	

4 General description

4.1. Dimensions and Weight

	Specification	NOTE
Dimension	W: 400 mm (Body. Without Base) D: 435 mm (Body. Without Base) H: 1350 mm (Without IV pole and Signal tower) H: 1750 mm (With signal tower) H: 1600 to 2100 mm (With IV pole)	Dimensions of Base: 465 (W) × 985 (D): Including disinfectant bottle base (760 mm for without disinfectant bottle base)
Weight	Approx. 110kg (Dry condition)	Without liquid at hydraulic.

4.2. Electrical Safety (Ordered by EN60601-1)

	Specification	NOTE
Class of electrical classification	CLASS I	None
Type of electrical classification	Type B	Symbol:
Protection against the penetration of fluids	IPX1	Symbol: **IPX1** (Machine Type3 only)
Leakage currents	In normal condition: Earth leakage current: 0.5 mA or less Enclosure leakage current: 0.1 mA or less At single fault condition: Earth leakage current: 1.0 mA or less. Enclosure leakage current: 0.5 mA or less	None
EMC	EMC standard for conformity: IEC60601-1-2 Ed. 2.0: 2001 Based on JFMDA (Japan Federation of Medical Devices Associations) EMC standard for conformity (Guideline) for medical electric devices April 1997 enacted (February 1998 amd.)	None (Machine Type3 only)

4.3. Electrical Supply

	Specification	NOTE
Line voltage	230 V AC, ±10% 110 V AC, ±10%	It has Battery option. See option specification.
Frequency	50 Hz/ 60 Hz	
Power consumption	Equipment: Less than 2200 VA (At rated power supply)	

4.4. Fuses

	Specification	Qty.	NOTE
Circuit Breaker	Circuit protector 2 X 15A	-	Rear of Power Supply Unit
Heater Control Unit	Tube Fuse AC250V T8.0AH	2	(Machine Type3 only) 230 V AC Type only
Pump Driver Board	Tube Fuse AC250V T3.15AL	2	(Machine Type3 only)
Battery	Tube Fuse AC250V T6.3AH	1	(Machine Type3 only)

4.5. External connections

	Specification	NOTE
RS-232	Interface for serial communication with computer.	Not used at the moment
Nurse call		Not used at the moment

4.6. Storage and transportation

	Specification	NOTE
Storage temperature	-15 to 40 °C (without water in piping) 5 to 40 °C (with water in piping)	Factory default: Water is eliminated when shipped
Storage humidity	10 to 90%	Non condensing
Transportation temperature	-15 to 40 °C (without water in piping) 5 to 40 °C (with water in piping)	None
Transportation humidity	10 to 90%	Non condensing
Atmospheric pressure	700 to 1062 hPa	None

NOTE

When resuming use after storage, allow the system to stand and raise to the room temperature before turning on the power switch.

4.7. Operating Conditions

	Specification	NOTE
Water inlet Pressure	0.1 up to 0.73 MPa (1.0 up to 7.5 kgf/cm^2)	None
Water inlet flow	More than 1100 mL/min	
Water inlet temperature	5°C up to 30°C	·To be at least 5°C lower than dialysate set temperature. ·Fluctuation of temperature per 1 min. must be within ±1°C.
Water drain	Minimum drain capacity: More than 1500 mL/min Height of drain: Max 60 cm above the ground.	No less than 5 cm free fall. The water drain must be located at a lower level than that of the dialyzer position.
Concentrate supply	0.00 to -0.01 MPa (0.000 up to -0.102 kgf/cm^2) Connection height: Max. 50 cm	
Surrounding space	Following clearance must be secured against outside dimensions of equipment. Top clearance: 5 cm or more Side clearance: 10 cm or more Rear clearance: 20 cm or more For ventilation, there must be a ventilation opening of Φ20 cm or more, or one of top, side, and rear must be open to atmosphere.	None
Range of operating temperature	15 to 35°C	To be at least 5°C lower than dialysate set temperature.
Air humidity	35 to 80%	Non condensing
Norms for water quality	Use water of quality meeting AAMI - approved American National Standard for Haemodialysis System, RD5, 1981, Section 3.2.	None

4.8. Hydraulics

4.8.1. Blood Leak Detector

	Specification	NOTE
Method	Optical	
Sensitivity	Range: 0 to 370 ppm (1ppm increment)	190ppm (0.09 mL blood/L, Hematocrit 32%)

⚠ CAUTION

When the dialysate flow turned off, the Blood leak alarm response is delayed.
The reaction time depends on the volume between the dialyzer and the Blood leak detector (approx. 200mL total fluid volume) and as well on the Ultrafiltration rate.

4.8.2. Transmembrane Pressure

	Specification	NOTE
Alarm range	Lower limit: -100 to 300 mmHg (Back filtration alarm) Upper limit: 10 to 600 mmHg	None
Calculation	TMP =PG5-PG3+TMP OFFSET PG3=Dialysate pressure at the exit of the dialyzer PG5=Venous pressure. TMP OFFSET= Pressure changes depending on flow	
Accuracy	±20 mmHg	

4.8.3. Dialysate Pressure

	Specification	Condition
Measurement range	-450 up to +450 mmHg	None
Accuracy	±10 mmHg	
Auto fixing Alarm range	Lower Width: -200 mmHg to -50 mmHg Upper Width: 50 mmHg to 200 mmHg	(Relative value from present value)
Alarm Limit	Lower limit: -450 to 450 mmHg Upper limit: -450 to 450 mmHg	None

4.8.4. Ultrafiltration

	Specification	Condition
Ultrafiltration rate	0.00 L/h up to 5.00 L/h	Set to Max. 2 L/h on shipment.
Accuracy	0.00-3.00 L/h: ±30g/h 3.00-5.00 L/h: 1% of setting	When equipment is adjusted in the accuracy same as done on shipment.
Control and Safety system	Volumetric system by the balancing chamber.	None
	Monitoring of UF pump, TMP	
Max. ratio of UF pump against BP	10 to 100% (Setting is possible by 1% increment.)	
UF-Profile	6 types of profile can be selected.	
UF-Volume	0.00 to 99.99 L	0.01 L increment

4.8.5. Degassing

	Specification	NOTE
Deaeration method	Negative pressure deaeration method	None
Dissolved gas in dialysate	Max.: 0.019 MPa (140 mmHg)	When water temperature at deaeration is 37°C When dissolved oxygen partial pressure at deaeration is 0.027 MPa (200 mmHg)

4.8.6. Acetate Dialysis

	Specification	Condition
Setting range	10.0 to 17.0 mS/cm (0.1 mS/cm increment)	On shipment, TOTAL is set to a value within (12.6 to 15.4 mS/cm) range.
Accuracy	±0.3 mS/cm	
Alarm range	1 to 20% of set value	CD1 and CD3
Dilution ratio	1/20.00 to 1/45.00 (Input denominator by 0.01 increment.)	None

4.8.7. Bicarbonate Dialysis

	Specification	Condition
Bicarbonate Setting range	1.0 to 8.0 mS/cm (0.1 mS/cm increment)	On shipment, W+B is set to a value within (2.5 to 3.1 mS/cm) range.
Accuracy	±0.3mS/cm	
Bicarbonate Alarm range	1 to 14% of set value	CD2 and CD4
Bicarbonate Dilution ratio	1/20.00 to 1/70.00 (0.01 increment)	None
Total Mixed Setting range	10.0 to 17.0 mS/cm (0.1mS/cm increment)	On shipment, TOTAL is set to a value within (12.0 to 16.0 mS/cm) range.
Accuracy	±0.3 mS/cm	
Total Mixed Alarm range	1 to 20% of set value	CD1 and CD3
Dilution ratio	1/20.00 to 1/45.00 (Input denominator by 0.01 increment.)	None

4.8.8. Dialysate Temperature

	Specification	Condition
Setting range	30.0°C up to 40.0°C (0.1°C increment)	Inlet water temperature must be at least 5°C higher than dialysate set temperature. Surrounding temperature must be at least 5°C lower than dialysate set temperature.
Accuracy	Measured value±0.8°C	Measured value=Average for 1 min.
Alarm range	29.0°C to 41.0°C (0.1°C increment)	T1 and T3 sensors
Sensor type	Thermistor	None

4.8.9. Dialysate Flow Rate

	Specification	NOTE
Setting range	300 to 700 mL/min	
Accuracy	±10%	
Safety system	Monitoring of the Flow switch 2.	

4.9. Extra corporeal Blood Circuit

4.9.1. Arterial Pressure

	Specification	NOTE
Measurement range	-300 to +600 mmHg	None
Accuracy	±10 mmHg	
Auto fixing Alarm range	Lower Width: -200 mmHg to -10 mmHg Upper Width: 10 mmHg to 200 mmHg	(Relative value from present value)
Alarm Limit	Lower limit: -300 to 600 mmHg Upper limit: -300 to 600 mmHg	None

4.9.2. Venous Pressure

	Specification	NOTE
Measurement range	-200 to +400 mmHg	None
Accuracy	±10 mmHg	
Auto fixing Alarm range	Lower Width: -200 mmHg to -10 mmHg Upper Width: 10 mmHg to 200 mmHg	(Relative value from present value)
Alarm Limit	Lower limit: -200 to 400 mmHg Upper limit: -200 to 400 mmHg	None
Level adjuster	Pressure infusion button does not work during Venous pressure high alarm condition for preventing over pressure.	None

4.9.3. Air Bubble Detector

	Specification	NOTE
Sensor type	Ultrasonic sensor	None
Applicable tube	Tube material: Soft PVC	However, limited to NIPRO's standard blood line for DIAMAX.
Detection capability	<Single bubble> Outputs alarm when a bubble of 10μL or more is detected.	·Flow rate: 200 mL/min ·Fluid temp.: 37±1.0°C Detecting sensitivity differs depending on flow rate of the bubble that passes bubble sensor.

4.9.4. Blood Pump

	Specification	Condition
Blood pump type	2 roller type Automatic gap adjustment (Gap adjustment spring: For large dia. tube: 3.5 to 4.0 mm, For small dia. tube: 4.0 to 5.0 mm)	None Spring gap on shipment: 3.5 mm (one side)
Setting range	For large dia. tube (Setting on shipment from factory) 50 to 600 mL/min For small dia. tube 50 to 450 mL/min	Large dia. tube: φ8.00×φ12.00±0.15 mm Length: 210 mm or more Small dia. tube: φ6.35×φ9.75±0.15 mm Length: 210 mm or more (Max. flow rate may not be achieved by permanent fatigue, etc. of rolling tube.)
Accuracy	±10% of set value	Entrance pressure :Within ±150 mmHg Exit pressure :0 up to +500 mmHg
BP stop alarm delay time	0 to 120 sec. (Setting is possible by 1 sec. increment.)	Time from BP stop till alarm output

4.9.5. Syringe Pump

	Specification	Condition
Type	One cylinder type	·NIPRO 20mL standard syringe
Setting range	0.1 to 9.9 mL/h	None
Accuracy	±10%	NIPRO 20 mL syringe
Overload detection	Detection load: Approx. 53.9 to 58.8 N/cm^2 (Approx. 5.5 to 6.0 kgf)	When NIPRO 20cc new syringe (with low pusher resistance) is used, discharge pressure will be approx. 600 to 700 mmHg.
Fast infusion (Rapid speed)	Approx. 2200 mL/h (NIPRO 30 cc syringe) Approx. 1500 mL/h (NIPRO 20 cc syringe) Approx. 750 mL/h (NIPRO 10 cc syringe)	
One-shot infusion (Bolus volume)	0.5 to 5.0 mL	NIPRO 20 mL syringe
Prior stop function	1 to 60 min	None
Other applicable syringe	Setting by syringe ratio (50 to 150%)	None

4.9.6. Single Needle Single Pump

	Specification	Condition
One stroke minimum blood volume	0 to 1000 mL (Setting is possible by 1mL increment.)	
Reaction time over	5 to 30 sec. (Setting is possible by 1 sec. increment.)	
Rotation limit over alarm	1 to 1000mL	On shipment 100 mL
Setting range of blood pressure switching alarm	Lower limit: -200 to -10 mmHg (Setting is possible by 10 mmHg increment.) Upper limit: 10 to 200 mmHg (Setting is possible by 10 mmHg increment.)	(Relative value from present value)
Possible setting range of blood pressure switching alarm	Min.: -350 to 500 mmHg (Setting is possible by 10 mmHg increment.) Max: -300 to 550 mmHg (Setting is possible by 10 mmHg increment.)	

4.10. Rinse

	Specification	NOTE
Water rinse	Rinse time: 10 to 60 min	Rinse
Hot water rinse	Set temperature: 75 to 85°C, and Rinse time: 20 to 60 min	Rinse
Acetic acid rinse	Acetic acid concentrate 5 to 70%, Dilution concentration: 0.5 to 5%, and Rinse time: 10 to 60 min	Decalcification
Citric acid rinse	Citric acid concentrate: 10 to 50%, Dilution concentration: 1 to 10%, and Rinse time: 10 to 60min	Decalcification
Hot citric acid disinfection	Set temperature: 75 to 85°C, Citric acid concentrate: 10 to 50%, Dilution concentration: 1 to10%, and Rinse time: 10 to 60 min	Disinfection and Decalcification
Peracetic acid disinfection	Peracetic acid concentrate: 3 to 12%, Dilution concentration: 0.01 to 0.3%, and Rinse time: 10 to 60 min	Disinfection and Decalcification
Sodium hypochloride disinfection	Sodium hypochloride concentrate: 3 to 12%, Dilution concentration: 0.01 to 0.3%, and Rinse time: 10 to 60 min	Disinfection
Dwell	Soaking time: 1 to 60 min	

4.11. Override

	Specification	NOTE
Alarm suppression	Alarm goes off for the second time 2 minutes after the initial alarm stops	When the system detects a new alarming event during the 2 silent minutes, alarm goes off
Air Bubble Detector override	Limited by the BP rotation frequency or time	On shipment, 6 rotation OVERRIDE is enabled
BP stop alarm delay time	0 to 120 sec. (Setting is possible by 1 sec. increment.)	Time from BP stop till alarm output

4.12. Range of sound pressure levels

	Specification	NOTE
Sound pressure range	0 to 65dB or more	Measure 1 m away from the back of the system Adjustable sound pressure level

4.13. Options

4.13.1. Battery

	Specification	NOTE
Type	Valve regulated (sealed) lead-acid battery	None
Capacity	24 V / 7Ah (12 V * 2)	None
Charging time	72h	Charged when the breaker is "On"
Continuous operation time	More than 30 min.	When new and fully charged
Storage temperature	-15 to 40 °C	None

Note: Deterioration of the battery can decrease continuous operation time. Please exchange batteries annually. Replace of Batteries, please contact nearest branch or agency.

Ensure to full charge the battery before long-term storage.
Periodical charging can decrease battery deterioration during long-term storage. The following table shows an example of storage temperatures and charging intervals.

Storage temperature	Charging interval
25°C or less	Within 6 months
30°C or less	Within 4 months
35°C or less	Within 3 months
40°C or less	Within 2 months
40°C or more	Do not store at this temperature

⚠ WARNING

Replacement of the Battery, please replace factory-authorized battery.

4.13.2. Dialyzer Inlet Pressure

	Specification	NOTE
Measurement range	-250 to 650 mmHg	None
Accuracy	±10 mmHg	
Auto fixing Alarm range	Lower Width: -200 mmHg ~ -10 mmHg Upper Width: 10 mmHg ~ 200 mmHg	(Relative value from present value)
Alarm Limit	Lower limit: -250 to 650 mmHg Upper limit: -250 to 650 mmHg	None

4.14. Used Materials for dialysate line

The following Materials have direct contact with water, dialysate and dialysate concentrate.

	Materials	Abbreviation
Metals	Stainless Steel	SCS14 *
	Stainless Steel	SUS316 *
	Stainless Steel	SUS316L *
	Stainless Steel	SUS316-WPA *
	Stainless Steel	SUS316-WPB *
Plastic	Poly phenylene sulfide	PPS GF 40%
	Polysulfone	PSU
	Polyetheretherketone	PEEK (CF+PTFE)
	Polypropylene	PP
	Polyethylene	PE
	Poly vinylindene fluoride	PVDF
	Polytetrafluoroethylene	PTFE
Rubber	Fluorocarbon rubber	FKM
	Silicone	Si
Others	AL_2O_3 Ceramic	

Caution: Abbreviation of Materials accompanied by asterisk are based on JIS (Japanese Industrial Standard).

5 REGULAR INSPECTION

5.1. Precautions Before Working

5.1.1. Maintenance personnel

Maintenance of the machine must be done only by the persons who have received the training of this machine provided by the manufacturer and sufficiently mastered its skills and expertise.

5.1.2. Clothes when performing maintenance/inspection

Wear clothes made of a material not likely to generate static electricity since electrical parts such as P.C. boards are weak to static electricity. Also, wear clothes easy to work not causing any injury or accident.
Wear shoes not slippery even on the wet floor since water may be spilt on the floor during maintenance work.

5.2. Handling of Machine

5.2.1. Maintenance procedure

Carefully read the service manual, the instruction manual, etc. for the handling of the machine. After sufficiently acquiring its characteristics, etc, perform maintenance of it as specified.

5.2.2. Precautions when working

Perform maintenance after establishing the conditions in which any influence is given to other equipment such as those in the power supply system, the water supply and drainage lines, etc. Keep the floor dry while working since there is a danger of an electric shock or a worker may slip and fall if the floor is wet.

⚠ CAUTION

There is a possibility of infection if performing maintenance of the dialysate line without performing sufficient disinfection. Before servicing the dialysate line, always disinfect the line sufficiently.

5.3. Replacement of Parts

Use only parts specified by the manufacturer when replacing a part.

5.4. Responsibility for Readjustment and Repair

The persons who have executed readjustment and/or repair must take the responsibility of a series of troubles occurred related with the readjustment and/or repair.

5.5. Daily Inspection by Operator

The operator needs to check the following points to make sure that the machine is in a good condition before and after using it every day.

1. No water is spilt on the floor to prevent an electric shock and/or falling
2. Hoses for water supply and drainage have no flaw, damage, fold, etc.
3. Hoses are properly connected to the water supply inlet connector and the drainage outlet connector.
4. The power plug is properly connected.
5. No foreign matters such as concentrate, disinfectant, etc. are adhered to the outer surface of the machine.
6. The machine has passed all the start-up tests done when the power ON/OFF switch is turned ON or the dialysis preparation process begins without causing any trouble.

5.6. Maintenance Inspection

Check the hour meter at the rear of the machine, and perform periodical inspection specified every 3500 hours (only UF/concentrate pump), every 5000 hours or every 6 months.

5.7. Inspection to be done after Long-Term Storage

When using the machine after the interval for two weeks or more, perform acid washing and disinfection sufficiently, and also be sure to perform maintenance inspection.
Parts such as rubber parts and periodical replacement parts may be degraded depending on the storage environment. When using the machine after long-term storage, it is recommended to inspect rubber parts and periodical replacement parts before operating the machine after long-term storage.

6 MAINTENANCE INSPECTION

In order to use the machine safely for a long time, it is necessary to perform maintenance inspection periodically by an engineer who has acquired the expertise of the machine. Perform scheduled maintenance referring to the maintenance manual in Chapter 7 and the replacement parts list for maintenance in Chapter 11.

Make a copy of the maintenance check & record list in Chapter 8 and utilize it in regular maintenance since it can also serve as the checklist for the regular maintenance.

7 MAINTENANCE MANUAL

7.1. Inspection of Appearance, Connection Tubes, Power Cables, etc.

7.1.1. Inspection of connection tube conditions

Verify that there is no deterioration, damage, etc. with the water supply hose and the drainage hose.

Contents of work	Judgment standard	Remarks
Visually check that there is no fold, deterioration, and damage with the water supply and drainage hoses.	Judged as PASS when no fold, deterioration, damage, etc. are found.	

7.1.2. Inspection of connecting conditions of water supply and drainage hoses

Verify that the water supply hose and the drainage hoses are correctly connected.

Contents of work	Judgment standard	Remarks
Visually check that the water supply hose and drainage hoses are properly connected to their inlet and outlet connectors respectively.	Judged as PASS when correctly connected to the connector with a hose band not causing any leakage.	

7.1.3. Inspection of power cable damage

Verify that there is no deterioration, damage, etc. with the power cable.

Content of work	Judgment standard	Remarks
Visually check that the power cable is not kinked, deteriorated, or crushed.	Judged as PASS when no kink, deterioration, crush, etc. are found.	

7.1.4. Inspection of appearance

Verify that there is no damage, deforming, stain, etc. on the externals of the machine that may influence on the functions of the machine.

Content of work	Judgment standard	Remarks
Visually check that there is no damage, deforming, stain, etc. that may influence on the functions of the machine.	Judged as PASS when no damage, deforming, stain, etc. are found.	

7.1.5. Confirmation of fold, damage, deterioration, etc. of tubes

Confirm that there is no fold, damage, deterioration, etc. with tubes.

Content of work	Judgment standard	Remarks
Open the front door, and visually check that each tube has no damage, deforming, deterioration, etc. Also, visually check that screws are not loose.	Judged as PASS when no fold, damage, deterioration, etc. are found.	

7.1.6. Confirmation of fold damage, deterioration, etc. of harness

Confirm that there is no damage and deterioration with the harness inside the machine.

Content of work	Judgment standard	Remarks
Open the front door and visually check that there is no damage and deterioration with each harness.	Judged as PASS when no damage, deterioration, etc. are found.	

7.1.7. Inspection of color lamps

Confirm that the color lamps function properly in the processes that the color lamps blink.

For example, while running Dialysate calibration Program, the color lamps blink in the order of "red → yellow → green → blue" while the water supply program runs.

Refer to Chapter 16 Color Lamps - State Diagram.

7.2. Inspection of Dialysate Line

7.2.1. Confirmation of Open/Close frequency of solenoid valve

Check the frequency of opening and closing of solenoid valves.

Content of work	Judgment standard	Remarks
1. Turn ON the power supply. 2. Log in with the TECHNICIAN mode and press the MENU-TECHNICIAN tab. Select MONITOR-MAINTENANCE DATA to display the maintenance data screen for each part. (See Note below) 3. Press TURN button at the bottom in the screen. 4. Open/Close frequency of each valve is displayed. 5. Confirm the open/close frequency of each valve is less than one million times. 6. Return to the original screen by pressing EXIT button at the bottom in the screen.	Judged as PASS if open/close frequency does not exceed one million times with all valves.	The hierarchy of the maintenance data screen differs depending on software versions.

Note) For software version VO1, log in with the MAKER mode and press the MENU –MAKER tab. Select MAINTENANCE DATA to display the maintenance data screen for each part.

7.2.2. Confirmation of solenoid valve operation

Confirm that solenoid valves operate properly.

Content of work	Judgment standard	Remarks
1. Open the front door and draw out the dialysate line. 2. Turn ON the power supply, log in the TECHNICIAN mode, press MENU-NURSE tab, and select MONITOR - FLOW MONITOR to display the flowchart of the dialysate line. 3. Press FORCED OUT button at the bottom in the	Judged as PASS if operation sound is heard with all valves.	

Content of work	Judgment standard	Remarks
screen. 4. Open or close each valve on the screen by the pressing a each valve. 5. Confirm the operation sound heard when each valve opens or closes. 6. Return to the original screen by pressing EXIT button at the bottom in the screen.		

7.2.3. Confirmation of Pressure regulator (PR1) operation

Confirm that reducing valves operate properly.

Content of work	Judgment standard	Remarks
1. Stop the water supply. 2. Open the front door and draw out the dialysate line. 3. Open the door at the rear side of the dialysate line and connect the pressure gauge on the OUT side of the reducing valve. 4. Turn ON the power supply and begin the dialysis preparation process. 5. Press MENU-NURSE tab and select MONITOR - FLOW MONITOR to display the flowchart of the dialysate line. 6. Measure the pressure on the reducing valve OUT side while filling the chamber, referring to the flowchart. 7. Return to the previous screen by pressing EXIT button at the lower right in the screen and stop the dialysis preparation process after the measurement is completed. 8. Turn OFF the power supply, stop the water supply, remove the pressure gauge, and restore the original piping.	Judged as PASS if the pressure is 0.025 ± 0.01 MPa (0.26 ± 0.1 Kgf/cm2)	Measure the pressure after the indication of the pressure gauge has settled.

If the judge was not PASSED, refer to Chapter 15, and readjust or replace PR1.

(Type 2 Pressure regulator can not readjust. Please refer Chapter 11.)

NOTE

Do not wet inside of the machine when removing the tubing in the dialysate line. Wipe off immediately if wet.

7.2.4. Confirmation of deaeration pressure

Confirm that the deaeration pressure is normal.

Content of work	Judgment standard	Remarks
1. Open the back cover at the rear side of the dialysate line and connect a pressure gauge between buffer tank (BT1) and deaeration orifice (OL3). 2. Turn ON the power supply and start the dialysis preparation process. 3. Read out the indication of the pressure gauge. 4. Stop the dialysis preparation process after the measurement is completed. 5. Turn OFF the power supply, remove the pressure gauge, and then restore the original piping.	Judged as PASS if the pressure is - 0.08 MPa (-0.82 Kgf/cm2) or less.	Measure the pressure after the indication of the pressure gauge has settled.

7.2.5. Confirmation of deaeration pump (P1) flow rate

Confirm the flow rate of the deaeration pump.

Content of work	Judgment standard	Remarks
1. Turn ON the power supply and start the dialysis preparation process. 2. Press MENU-NURSE tab, select MONITOR - FLOW MONITOR to display the flowchart of the dialysate line. 3. Read out the flow rate display of P1 after the operation in the line has become stable (about 5 minutes). 4. Stop the dialysis preparation process after the measurement is complete. 5. Turn OFF the power supply.	Judged as PASS if the flow rate is 750 mL/min or higher.	Measure the flow rate after the operation of the line has become stable.

If the judge was not PASSED, refer to Chapter 15, and readjust P1 flow rate.

7.2.6. Confirmation of dialysate pump (P2) flow rate

Confirm the flow rate of the dialysate pump.

Content of work	Judgment standard	Remarks
1. Turn ON the power supply and start the dialysis preparation process. Start with the dialysis flow rate set at 500 mL/min. 2. Press MENU-NURSE tab and select MONITOR - FLOW MONITOR to display the flowchart of the dialysate line. 3. Read out the flow rate indication of P2. 4. Stop the dialysis preparation process after the	Judged as PASS if the flow rate is 500 ± 50 mL/min.	Measure the flow rate after the operation of the line has become stable.

Content of work	Judgment standard	Remarks
measurement is complete. 5. Turn OFF the power supply.		

If the judge was not PASSED, refer to Chapter 15, and readjust P2 flow rate.

7.2.7. Operating condition of deaeration tank (AS1)

Confirm that the air separation tank is working properly.

Content of work	Judgment standard	Remarks
1. Open the front door and draw out the dialysate line. 2. Turn ON the power supply and start the dialysis preparation process. 3. Visually check the piping on top of the deaeration tank in which deaerated air flows. 4. Stop the dialysis preparation process after confirmation is complete. 5. Turn OFF the power supply.	Judged as PASS if water flow is not visually observed.	

7.2.8. Confirmation of relief valve (RV1) operation

Confirm the relief valve operates properly.

Content of work	Judgment standard	Remarks
1. Open the front door and draw out the dialysate line. 2. Open the back cover at the rear side of the dialysate line and connect a pressure gauge on the high-pressure side (deaeration tank side) of Relief Valve 1. 3. Turn ON the power supply and start the dialysis preparation process. 4. Press MENU-NURSE tab and select MONITOR - FLOW MONITOR to display the flowchart of the dialysate line. 5. Measure the pressure after filling of the chamber, referring to the flow chart after the indication of the pressure gauge has become stable (about 5 minutes). 6. Return to the previous screen by pressing EXIT button at the lower right in the screen and stop the dialysis preparation process after the measurement is complete. 7. Turn OFF the power supply.	Judged as PASS if the pressure is 0.12 ± 0.03 MPa (1.2 ± 0.3 Kgf/cm2).	Measure the pressure after the indication of the pressure gauge has become stable.

If the judge was not PASSED, refer to Chapter 15, and readjust RV1.

7.2.9. Confirmation of relief valve (RV2) operation

Confirm the relief valve operates properly.

Content of work	Judgment standard	Remarks
1. Open the front door and draw out the dialysate line. 2. Connect a pressure gauge on the high-pressure side (air separator tank side) of Relief Valve 2. 3. Turn ON the power supply and start the dialysis preparation process. 4. Press MENU-NURSE tab and select MONITOR - FLOW MONITOR to display the flowchart of the dialysate line. 5. Measure the pressure when the chamber is being filled, referring to the flowchart. 6. Return to the previous screen by pressing EXIT button at the lower right in the screen and stop the dialysis preparation process after the measurement is complete. 7. Turn OFF the power supply.	Judged as PASS if the pressure is 0.08 ± 0.05 MPa (0.82 ± 0.5 Kgf/cm2).	Measure the pressure after the indication of the pressure gauge has settled.

If the judge was not PASSED, refer to Chapter 15, and readjust RV2.

7.2.10. Condition of piping

Check the conditions inside the dialysate line.

Content of work	Judgment standard	Remarks
1. Open the front door and draw out the dialysate line. 2. Open the back cover at the rear side of the dialysate line. 3. Turn ON the power supply and start the water rinse process. 4. Confirm that there is no leakage, fold, damage, deterioration, etc. with the dialysate line at sections such as tubes and tube joints. 5. Confirm that there is no leakage from the UF pump and the concentrate pumps. 6. Stop the rinse process and turn OFF the power supply. 7. Restore the former condition.	Judged as PASS if there is no fold, damage, deterioration, etc. with piping. Also judged as PASS if there is no leakage from the UF pump and the disinfectant pump.	Select water washing for the water rinse process for this inspection.

NOTE

You have to log in the TECHNICIAN mode to stop water rinse program.

7.3. Inspection of Blood Pump (BP)

7.3.1. Confirmation of play and abnormal noise at rotating part

Check the operating condition of the blood pump.

Content of work	Judgment standard	Remarks
1. Turn ON the power supply. 2. Prepare the bloodline and set it to the blood pump. 3. Operate the blood pump and fill the bloodline with water. 4. Set the blood pump flow rate to 100 mL/min and operate the blood pump. 5. Confirm that there are no abnormal noise, etc. 6. Turn OFF the power supply. 7. Turn the rotor with hand and confirm that there is no abnormality such as play, clack, etc. has occurred.	Judged as PASS if no abnormal sound is heard and no backlash or clack occurs during the operation of the pump.	Confirm bloodline not to collect bubbles.

7.3.2. Confirmation of blocking

Confirm that the blood pump is correctly blocking the tube.

Content of work	Judgment standard	Remarks
1. Turn ON the power supply. 2. Prepare the bloodline on the arterial side and set it to the blood pump. 3. Operate the blood pump and fill the bloodline with water. Confirm the bloodline to be filled with water, stop the blood pump. 4. Clamp the bloodline of arterial connection end of the dialyzer with a clamp. 5. Connect the pressure sensor connection end of the blood pump POST side chamber to the venous chamber connection port of the machine. 6. Press MENU-NURSE tab and select MONITOR-FLOW2 to display the flowchart of the bloodline. 7. Open the cover of the blood pump and set the value of PG5 to 375 mmHg (0.5Kgf/cm2) by rotating the rotor with hand. 8. Confirm that the pressure has not dropped by the measurement one minute after the value of PG5 becomes stable. 9. Remove the bloodline and turn OFF the power supply after the measurement is complete.	Judged as PASS if pressure of approx. 375 mmHg (0.5Kgf/cm2) is blocked and the pressure in one minute is within ±20 mmHg (0.03Kgf/cm2).	Begin measurement after the indication of PG5 has settled.

If the judge was not PASSED, refer to Chapter 15, and readjust BP rotor.

7.3.3. Confirmation of real flow rate

Confirm the real flow rate of the blood pump.

Content of work	Judgment standard	Remarks
1. Turn ON the power supply. 2. Prepare the bloodline and set it to the blood pump. 3. Operate the blood pump and fill the bloodline with water. 4. Set the blood pump flow rate to 100mL/min and operate the blood pump. 5. Measure the real flow rate for a minute with an electronic balance, etc. 6. Remove the bloodline and turn OFF the power supply after the measurement is complete.	Judged as PASS if the flow rate is 100 ± 10 mL.	

If the judge was not PASSED, refer to Chapter 15, and readjust flow rate.

7.4. Inspection of Syringe Pump (HP)

7.4.1. Operation of pusher

Confirm that the pusher is operating properly.

Content of work	Judgment standard	Remarks
1. Pick up the pusher lever to release its lock. 2. Slide it up and down to check for smooth movement.	Judged as PASS if the pusher operates smoothly.	

7.4.2. Confirmation of play and abnormal noise

Confirm the operation of the syringe pump.

Content of work	Judgment standard	Remarks
1. Turn ON the power supply. 2. Operate the syringe pump using the RAPID function and the BOLUS function. 3. Confirm that there is no abnormal noise, etc. 4. Turn OFF the power supply. 5. Open the front door and grease up the syringe drive screw of the syringe pump.	Judged as PASS if no abnormal noise is heard and syringe pump operates smoothly.	Recommended grease: MOLYCOTE G-NPASTE (DawCorning Corp.)

7.4.3. Confirmation of overload switch operation

Confirm that the syringe pump overload switch works properly.

Content of work	Judgment standard	Remarks
1. Turn ON the power supply. 2. Prepare the syringe with sufficient water inside and set it in the syringe pump. 3. Connect the tip of the syringe to the pressure	Judged as PASS if the pressure is 0.1-0.12 MPa (1.0-1.2 Kgf/cm2).	

Content of work	Judgment standard	Remarks
gauge. 4. Operate the syringe pump in the RAPID mode until the overload switch is activated. 5. Measure the pressure when the overload switch is activated. 6. Remove the syringe pump and turn OFF the power supply after measurement is complete.		

If the judge was not PASSED, refer to Chapter 15, and readjust syringe pump setting.

7.4.4. Confirmation of infusion volume

Confirm the discharge volume of the syringe pump.

Content of work	Judgment standard	Remarks
1. Turn ON the power supply. 2. Prepare a syringe with plenty of water inside and set it to the syringe pump. 3. Operate the syringe pump at 5 mL/h. 4. Receive the water discharged for 30 minutes with a container and measure the discharge amount with an electronic balance. 5. Remove the syringe pump and turn OFF the power supply when measurement is complete.	Judged as PASS if measured volume is 2.5 ± 0.375 mL.	

If the judge was not PASSED, refer to Chapter 15, and readjust syringe pump setting.

7.5. Inspection of Sensors

7.5.1. Confirmation of temperature sensor (T1- 4)

Confirm the temperature sensors operate properly.

Content of work	Judgment standard	Remarks
1. Turn ON the power supply. 2. Start the dialysis preparation process without A/B solutions. 3. Press MENU-NURSE tab and select MONITOR - FLOW MONITOR to display the flowchart of the dialysate line. 4. Compare the temperatures of T1 with T3, and T2 with T4 after the temperatures become stable. 5. Stop the process and turn OFF the power supply after the confirmation is complete.	Judged as PASS if the differences in conductivity between T1 and T3 and between T2 and T4 are within 0.5°C.	

If the judge was not PASSED, refer to Chapter 15, and readjust temperature sensor.

7.5.2. Confirmation of conductivity sensor (CD1- 4)

Confirm the conductivity sensor operates properly.

Content of work	Judgment standard	Remarks
1. Turn ON the power supply. 2. Prepare dialysate and start the dialysis preparation process and wait for the display of "CONNECT BLUE/RED COUPLER" to appear. 3. Press MENU-NURSE tab and select MONITOR - FLOW MONITOR to display the flowchart of the dialysate line. 4. Compare the conductivity of CD1 with CD3, and CD2 with CD4 after the conductivity become stable. 5. Stop the process, execute the rinse process to wash the inside of the dialysate line sufficiently, and then turn OFF the power supply.	Judged as PASS if the differences in temperature between CD1 and CD3 and between CD2 and CD4 are within 0.5 mS/cm..	

If the judge was not PASSED, refer to Chapter 15, and readjust conductivity sensor.

7.5.3. Confirmation of blood leak detector (BLD)

Confirm the blood leak detector operates properly.

⚠ CAUTION

The window of the liquid permeable part of the blood leak detector is made of glass, and it cracks easily. When cleaning the liquid permeable part, rinse with disinfectant without disassembling the machine.

NOTE

Perform the rinse process with disinfectant in advance when checking the blood leak detector.

Content of work	Judgment standard	Remarks
1. Turn ON the power supply. 2. Open the front door and draw out the dialysate line. 3. Start the dialysis preparation process without A/B solution. 4. Remove the cover plate of the blood leak detector. 5. Insert the filter plate into the place where the cover plate was removed. 6. Confirm that an alarm bell sounds.	Judged as PASS if an alarm bell sounds.	

Content of work	Judgment standard	Remarks
7. Remove the filter plate, restore the original cover plate, and turn OFF the power supply, interrupting the dialysis preparation process.		

7.5.4. Confirmation of air bubble detector (ABD)

Confirm that the air bubble detector operates properly.

Content of work	Judgment standard	Remarks
1. Turn ON the power supply. 2. Prepare bloodline, dialyzer, and dialysate, and start the dialysis preparation process. 3. Advance the process up to the RINSE OF DIALYZER process. Fill the bloodline with water. 4. Open the cover at the clamp section to make the air bubble detector work. 5. Confirm that an alarm bell sounds. 6. Stop the process, execute the rinse process to sufficiently wash the inside of the dialysate line, and then turn OFF the power supply.	Judged as PASS if an alarm occurs.	This confirmination must be in the “RINSE OF DIALYZER” process.

7.6. Inspection of Electrical Equipment

7.6.1. Confirmation of insulation resistance

Confirm that dielectric breakdown has not occurred by measuring the insulation resistance.

Content of work	Judgment standard	Remarks
1. Prepare an insulation-resistance tester and connect it to the power plug and ground terminal at the backside. 2. Measure the insulation resistance by operating the insulation-resistance tester.	Judged as PASS if the insulation resistance is 5 MΩ or more.	Applied voltage 500V.

7.6.2. Confirmation of earth leakage current

Confirm there is no current leak by measuring the earth leakage current.

Content of work	Judgment standard	Remarks
Prepare a measurement instrument for the earth leakage current and measure the leakage current of the machine according to the operating instructions of the prepared instrument.	Judged as PASS if leakage current is 0.5 mA or less.	Prepare a measuring instrument complied with IEC60601-1.

7.6.3. Confirmation of backup battery performance

Check the battery performance if the backup battery (Option) is furnished.

NOTE

Check the performance of the backup battery under the condition where the battery is fully charged. Electricity is being charged when the battery lamp at the lower right of the power ON/OFF switch is blinking and charge is complete when it is ON. The battery is automatically charged regardless of the ON/OFF condition of the power ON/OFF switch as long as the breaker is set ON.

Content of work	Judgment standard	Remarks
1. Turn ON the power supply. 2. Prepare the bloodline, set it to the machine, and fill it with water. 3. Operate the blood pump at 200 mL/min and the syringe pump at 5 mL/h. 4. Keep the pumps ON, pull out the power cable, and confirm that the pumps operate properly for 30 minutes. 5. Connect the power cable again, detach the bloodline, and then turn OFF the power supply. 6. Keep the breaker ON to charge electricity again.	Judged as PASS if the blood pump and the heparin pump operate properly for 30 minutes or more.	

NOTE

Though a new battery has the capability to operation the machine for 30 minutes or more, it deteriorates as time passes by regardless of the frequency of use. When deterioration is observed on the periodical inspection, replace the battery as soon as possible.

7.7. Inspection of Safety-related Devices

7.7.1. Confirmation of temperature error alarm

Confirm that the temperature error alarm is given properly.

Content of work	Judgment standard	Remarks
1. Turn ON the power supply. 2. Prepare dialysate and start the dialysis preparation process. Then, wait until the display of "CONNECT BLUE/RED COUPLER" appears. 3. After the display in Step 2 appears, log in the TECHNICIAN mode, press MENU-TECHNICIAN tab and select ALARM-TEMPERATURE to display the alarm-setting screen of the temperature sensors. 4. Change the value of T1 MAX or T1 MIN to change to a value within the range where an alarm is output at the present value of T1 displayed at the upper section in the screen. 5. After confirming that the alarm sounds, return the set value to the original value and then press EXIT button at the lower right in the screen to restore the	Judged as PASS if alarm bell sounds.	

Content of work	Judgment standard	Remarks
original screen. 6. Stop the dialysis preparation process and turn OFF the power supply after executing the rinse process to wash the dialysate line sufficiently.		

7.7.2. Confirmation of conductivity error alarm

Confirm the conductivity error alarm is output properly.

Content of work	Judgment standard	Remarks
1. Turn ON the power supply. 2. Prepare dialysate and start the dialysis preparation process. Then, wait until the display of "CONNECT BLUE/RED COUPLER" appears. 3. After the display in Step 2 appears, log in the TECHNICIAN mode, press MENU-TECHNICIAN tab and select ALARM-CONDUCTIVITY to display the alarm setting screen of the conductivity sensors. 4. Change the values of B+W and TOTAL in the column of “WIDTH” to “1%”. 5. After confirming that the alarm sounds, return the set value to the original value and then press EXIT button at the lower right in the screen to restore the original screen. 6. Stop the dialysis preparation process and turn OFF the power supply after executing the rinse process to wash the dialysate line sufficiently.	Judged as PASS if alarm bell sounds.	

7.7.3. Confirmation of hydraulic pressure error alarm

Confirm that the pressure error alarm is output properly.

Content of work	Judgment standard	Remarks
1. Turn ON the power supply. 2. Prepare dialysate and start the dialysis preparation process. Then, wait until the display of "CONNECT BLUE/RED COUPLER" appears. 3. After the display in Step 2 appears, log in the TECHNICIAN mode, press MENU-NURSE tab and select PRESSURE ALARM to display the alarm-setting screen of the conductivity sensors. 4. Press ARTERIAL button and select the arterial pressure of the bloodline setting screen. 5. Change the value of LOWER LIMIT or UPPER LIMIT to occur LOWER LIMIT or UPPER LIMIT alarm. 6. Confirm the alarm occurs, and return the value to the original value.	Judged as PASS if the alarm is output properly for each ARTERIAL, VENOUS, and DIALYSATE2.	

Content of work	Judgment standard	Remarks
7. Also, confirm that the alarm is output by the operation with VENOUS and DIALYSATE2. 8. Stop the dialysis preparation process and turn OFF the power supply after executing the rinse process to wash the dialysate line sufficiently.		

7.7.4. Inspection of venous clamp (CL)

Confirm the blocking performance of the clamp.

Content of work	Judgment standard	Remarks
1. Prepare the venous side bloodline filled with water and set it to the venous clamp section. Connect the bloodline to the dialysate pressure sensor connection port. 2. Turn ON the power supply. 3. Log in the TECHNICIAN mode, press MENU-NURSE tab, and select MONITOR-FLOW2 to display the flowchart of the blood line. 4. Clamp the dialyzer connection end of the bloodline and the needle connection end with a clamp etc. 5. Inject water into the chamber of the bloodline with the syringe so that the value of PG5 becomes 750mmHg (1.0Kgf/cm2). 6. Remove the clamp on the needle connection end side and wait for two minutes. Record the value of PG5 when the clamp is removed. 7. Record the value of PG5 in two minutes. 8. Remove the bloodline and turn OFF the power supply.	Judged as PASS if the difference between the value recorded in Step 6 and Step 7 is within 37.5mmHg (0.05 Kgf/cm2).	

7.8. Confirmation of dialysate making

Confirm that the dialysate is appropriately made.

Content of work	Judgment standard	Remarks
1. Turn ON the power supply. 2. Prepare dialysate, bloodline, dialyzer, and start the dialysis preparation process. Proceed the process up to the RINSE OF DIALYZER process. 3. Sample the dialysate from the sample port after the conductivity becomes stable and confirm that its conductivity is the set value. 4. Stop the dialysis preparation process and turn OFF the power supply after executing the rinse process to wash the dialysate line sufficiently.	Judged as PASS if the measured conductivity is the set value ± 0.3 mS/cm.	

8 MAINTENANCE CHECKLIST

Model: DIAMAX　　Serial No.:　　Operating hours when maintenance is performed:

Date of installation:　　Check date:　　Person checked:

1 Inspection of appearance, connection tubes, and power cables

No.	Contents of check	Result	Remarks (Contents of work, Exchanged parts, etc.)
7.1.1	Condition of connection tube		
7.1.2	Connecting conditions of water supply and drainage hoses		
7.1.3	Power cable damage		
7.1.4	Appearance		
7.1.5	Fold, damage, and deterioration of tubes		
7.1.6	Fold, damage, and deterioration of harness		
7.1.7	Color lamps		

Model: DIAMAX　　Serial No.:　　Operating hours when maintenance is performed:

Date of installation:　　Check date:　　Person checked:

2 Inspection of dialysate line

No.	Contents of check	Result	Remarks (Contents of work, Exchanged parts, etc.)
7.2.1	Open/Close frequency of solenoid valve		
7.2.2	Operation of solenoid valve		
7.2.3	Operation of reducing valve		
7.2.4	Deaeration pressure		
7.2.5	Deaeration pump (P1) flow rate		
7.2.6	Dialysate pump (P2) flow rate		
7.2.7	Operation of air deaeration tank (AS1)		
7.2.8	Operation of relief valve (RV1)		
7.2.9	Operation of relief valve (RV2)		
7.2.10	Condition of piping		

Model: DIAMAX　　Serial No:　　Operating hours when maintenance is performed:

Date of installation:　　Check date:　　Person checked:

3 Inspection of blood pump

No.	Contents of check	Result	Remarks (Contents of work, Exchanged parts, etc.)
7.3.1	Play and abnormal noise at rotating part		
7.3.2	Blocking		
7.3.3	Real flow rate		

4 Inspection of syringe pump (HP)

No.	Contents of check	Result	Remarks (Contents of work, Exchanged parts, etc.)
7.4.1	Play and abnormal noise		
7.4.2	Operation of pusher		
7.4.3	Operation of overload switch		
7.4.4	Infusion volume		

5 Inspection of sensors

No.	Contents of check	Result	Remarks (Contents of work, Exchanged parts, etc.)
7.5.1	Temperature sensor (T1-T4)		
7.5.2	Conductivity sensor (CD1-CD4)		
7.5.3	Blood leak detector (BLD)		
7.5.4	Air bubble detector (ABD)		

Model: DIAMAX　　Serial No:　　Operating hours when maintenance is performed:

Date of installation:　　Check date:　　Person checked:

6 Inspection of electrical equipment

No.	Contents of check	Result	Remarks (Contents of work, Exchanged parts, etc.)
7.6.1	Insulation resistance		
7.6.2	Earth leakage current		
7.6.3	Battery performance		

7 Inspection of safety-related devices

No.	Contents of check	Result	Remarks (Contents of work, Exchanged parts, etc.)
7.7.1	Temperature error alarm		
7.7.2	Conductivity error alarm		
7.7.3	Hydraulic pressure error alarm		
7.7.4	Venous clamp (CL)		

8 Others

No.	Contents of check	Result	Remarks (Contents of work, Exchanged parts, etc.)
7.8	Dialysate making		

9 INSTALLATION

Install this machine at a place that satisfies the following installation requirements.
In addition, installation work described in this chapter must be done by qualified persons who have received the specified training of this machine by the manufacturer.

⚠ WARNING

Installation of the machine must be done only by the persons who have received the training of this machine provided by the manufacturer and sufficiently mastered its skills and experience.

9.1. Power Supply

The following shows the ratings of the power equipment for this machine.

Power supply:	AC230V ± 10%, 50/60 Hz
	AC110V ± 10%, 50/60 Hz
Power consumption:	2.2 KVA MAX

The power equipment must have sufficient capacity enough to operate this machine.

⚠ WARNING

The power cable of DIAMAX is not designed to replace or to modify by users or technicians. If you need replace the cable, please contact the nearest branch or agency.

9.2. Water Supply Conditions, Drainage Conditions

Check the following points for the proper operation of the machine.

9.2.1. Water supply conditions

Water quality:	Clean water for dialysis (Quality water must satisfy the requirements enforced in the hemodialysis system U.S. standard RD5: Article 3.2 (1981))
Inlet pressure:	0.1 up to 0.73 MPa (1.0 up to 7.5 kgf/cm^2)
Volume of water:	1100 mL/min or more
Temperature:	5-30°C (Temperature variation: Below 1°C/min.)

9.2.2. Drainage conditions

Drainage volume:	1500 mL/min or more can be drained.
Drainage height:	0-60 cm (Head: 5 cm or more) Distal end of the drain tube must not contact with the surface of the water in the waste channel.
Drainage tube:	Tube can be used less than 3meters long.

9.3. Surrounding Space

Following clearance must be secured against outside dimensions of equipment.
Top clearance: 5 cm or more
Side clearance: 10 cm or more
Rear clearance: 20 cm or more
For ventilation, there must be a ventilation opening of Φ20cm or more, or one of top, side, and rear must be open to atmosphere.

⚠ DANGER

Make sure that the installation environment satisfies the above conditions. An improper installation environment may cause serious damage to the health of the operator or the patient as well as machine malfunctions.

⚠ CAUTION

This system requires special instruction for EMC. Read and follow the EMC-related information in the attached document of instruction manual carefully for installation and use.

9.4. Unpacking and Installation

⚠ DANGER

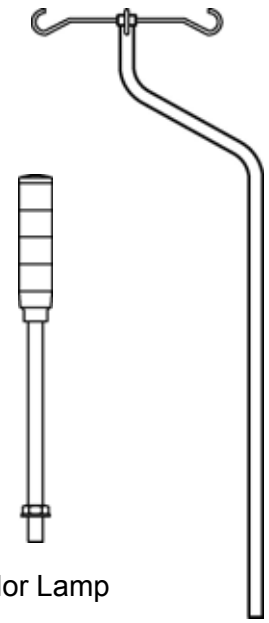
Dropping out of the package can cause serious accident, such as bone fractures. Never open the package if no one else is present. Handle the system carefully to avoid dropping it.

9.4.1. Unpacking Carton and Confirmation of accessories

Confirm that the following items are included inside the carton after unpacking the carton.

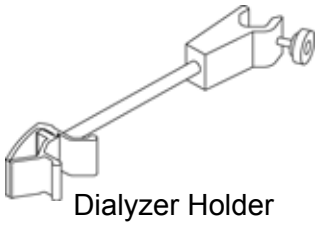
- IV Pole
- Color Lamp
- Disinfectant Tray
- Dialyser Holder
- Hexagonal Wrench (8 mm)
- Instruction Manual
- Disinfectant Nozzle Holder
- Disinfectant Nozzle
- Handle for Pole
- Tray
- Cross recessed head screw (2pieces)
- Cable fixture

Disinfectant Nozzle



Color Lamp

IV Pole



Dialyzer Holder

Instruction Manual

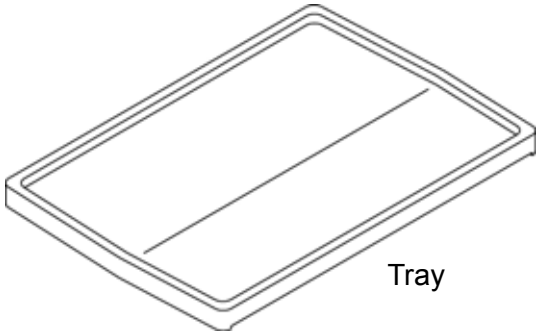
Handle for Pole

Cross recessed head screw

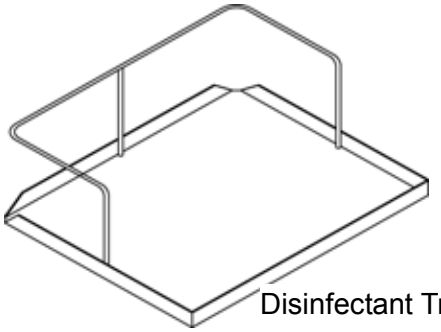
Hexagonal Wrench

Disinfectant Nozzle Holder

Cable fixture



Tray



Disinfectant Tray

9.4.2. Assembling accessories into machine

Following tools need to be prepared to assemble accessories into the machine.

- Phillips-head screwdriver
- Spanner (26 mm)

⚠ CAUTION

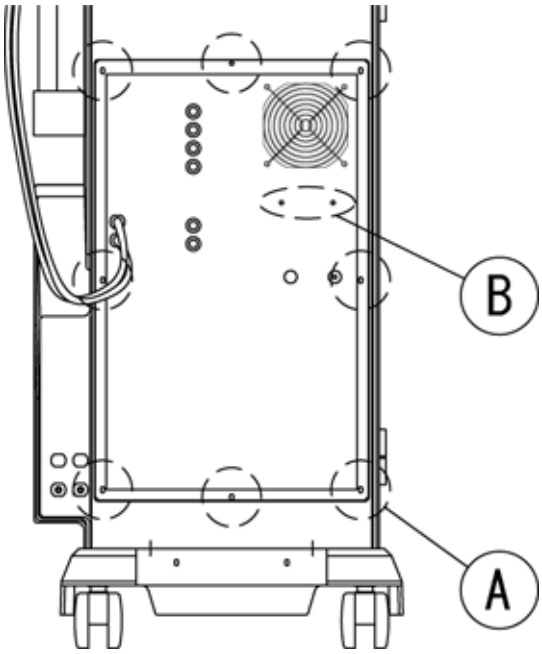
Note the following when assembling:
1. Work on a level and stable surface.
2. Ensure enough space for assembling.
3. Use the enclosed parts/accessories for assembling.

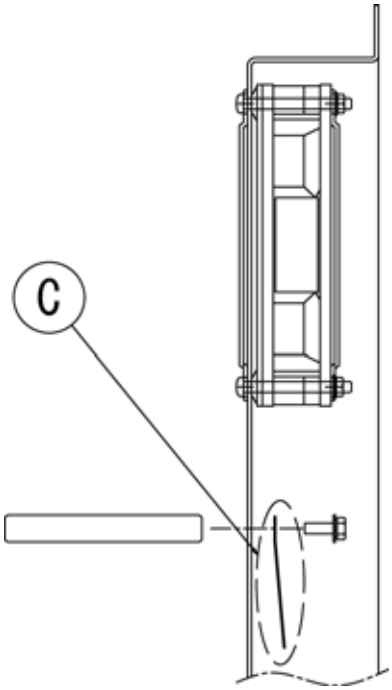
9.4.3. Assembling disinfectant nozzle holder/disinfectant tray

NOTE

The screws used in this machine are ISO metric screw threads. Use the tools that meet the metric screw threads.

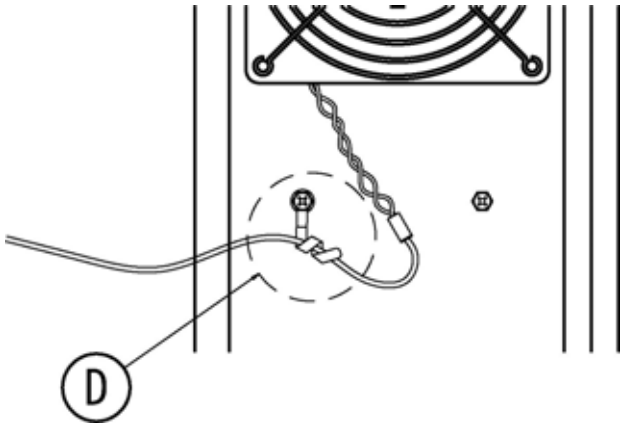
1. Unscrew the 8 screws [(A) circled in the figure] to remove the back cover of the hydraulic line. Since the tubes and wires are connected to the main machine, work carefully not to pull out them.



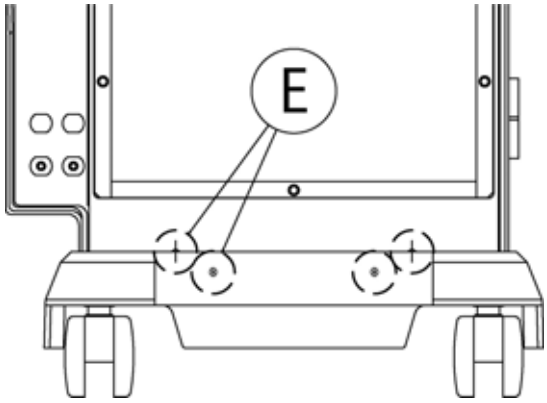


2. Through the holes [(B) circled in the figure above], attach the disinfectant nozzle holder on the backside of the removed back cover using the provided screws. Attach the nozzle holder with the flat side up. Tighten the nozzle holder together with the cable fixture [(C) circled in the figure on the left].

3. Fix the connector as (D) circled in the figure with the cable fixture tightened in step 2.

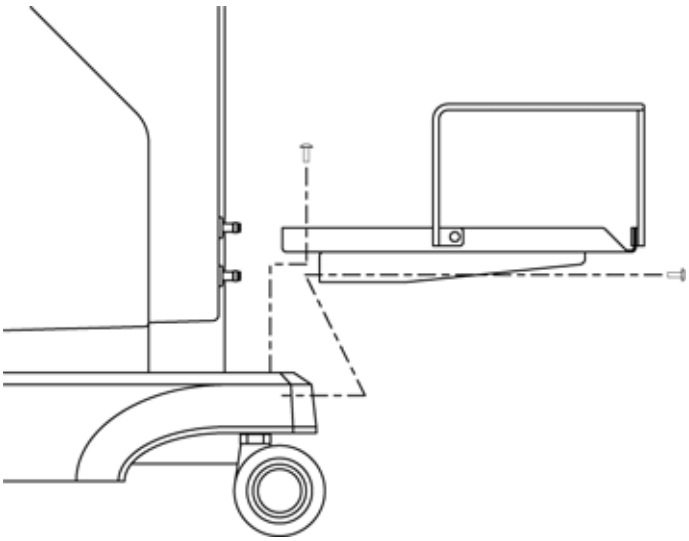


4. Remove the 4 truss head screws [(E) circled in the figure].



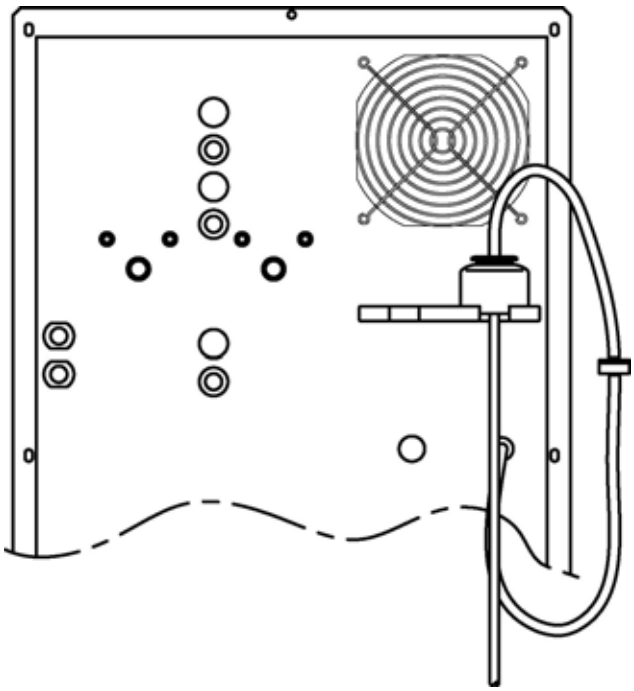
5. Using the Phillips-head screwdriver, fix the disinfectant tray with the truss head screws removed in the step 4.

6. Follow the step 1 procedure in reverse to re-install the back cover. Make sure not to fold the tubes or pinch the wires.

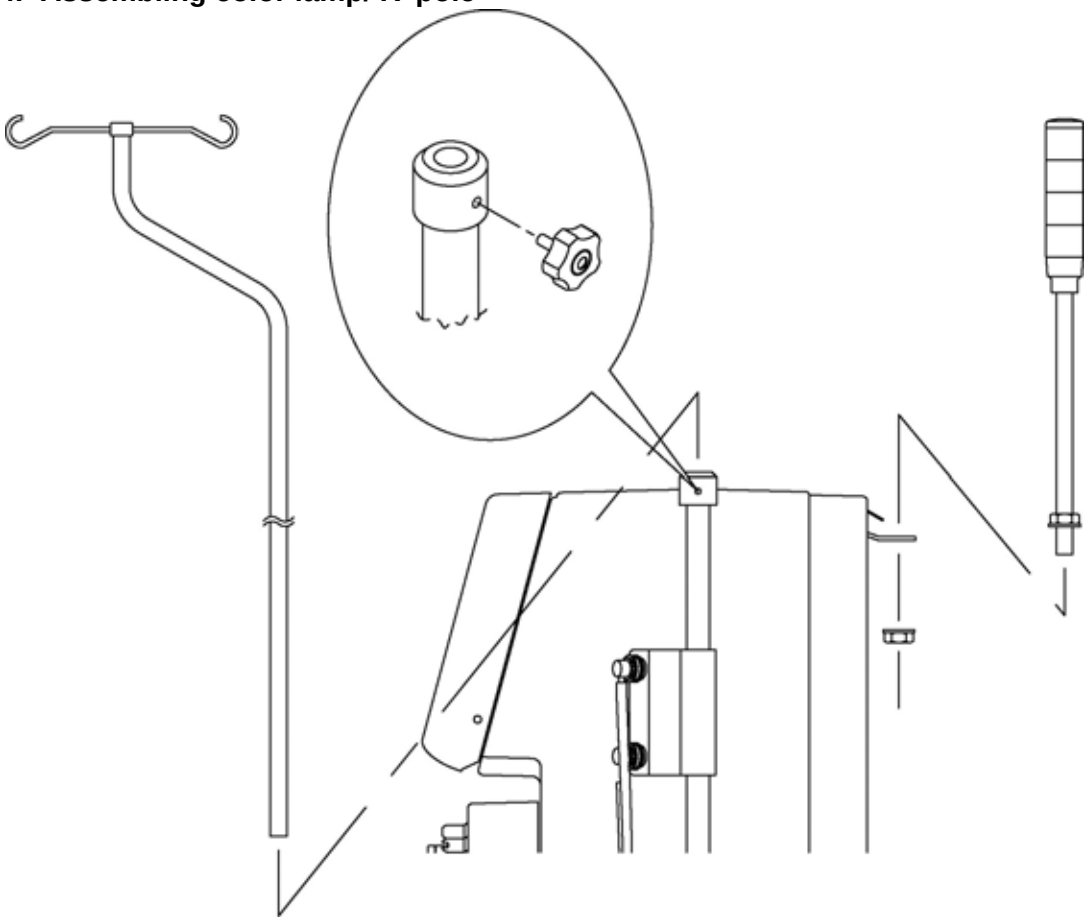


7. Connect the disinfectant nozzle to the edge of the thin tube hanging from the below the fan of the back cover of the hydraulic line.

8. When the disinfectant nozzle is not used, store it as in the figure on the right.



9.4.4. Assembling color lamp/ IV pole

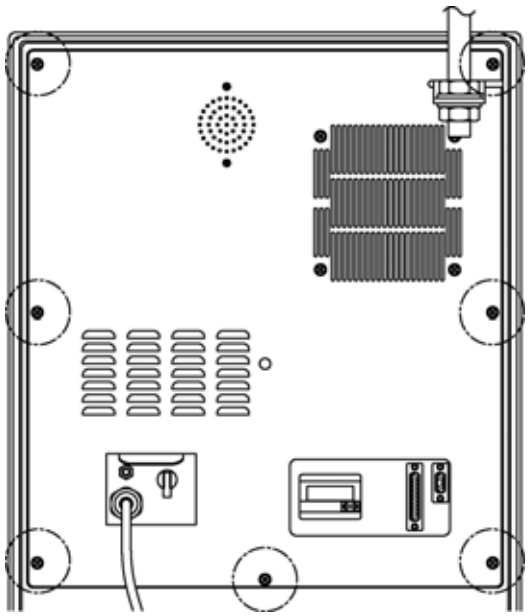


1. Insert the hanger to the fixed pole as the figure above.
2. Attach the handle for pole into the thread on the fixed pole.
3. Fix the IV pole at an adequate height by tightening up the handle for pole.
4. Insert color lamp to the bracket.
5. Fix the color lamp using the spanner (26 mm) as the figure above.

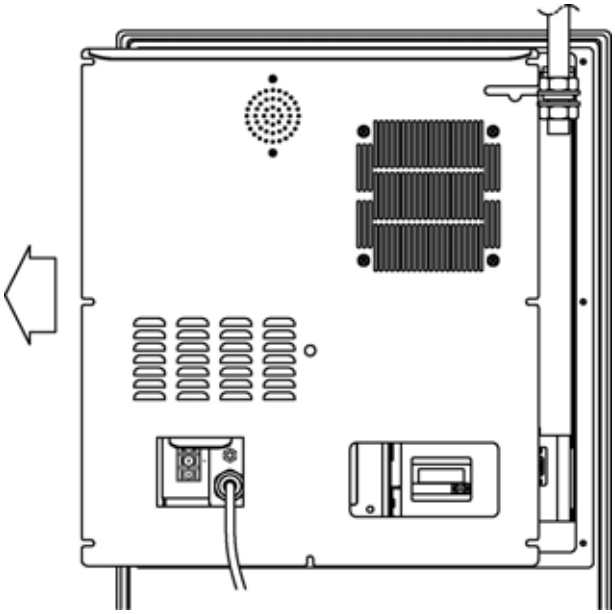
9.4.5. Wiring for color lamp

Connect the cables for the color lamp.

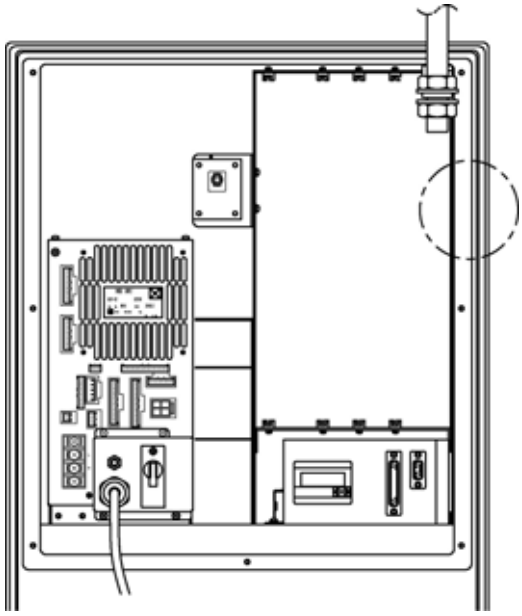
1. Remove the screws at seven circled sections in the right figure with the phillips screwdriver.



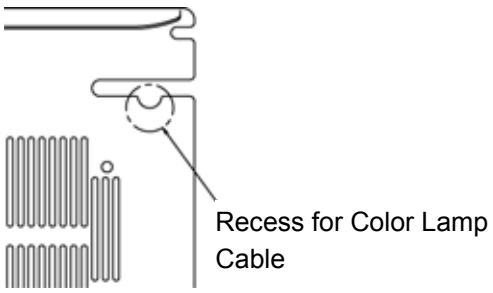
2. Remove the backside panel by sliding it in the arrow direction. The earth cable and the fan harness are connected to the backside panel. Turn over the backside panel, taking caution not to damage the power supply cord, remove the fan connector, and remove the earth cable with the Phillips screwdriver.



3. There is an unconnected connector at the circled portion in the right figure. Connect the connector of the color lamp with the unconnected connector.

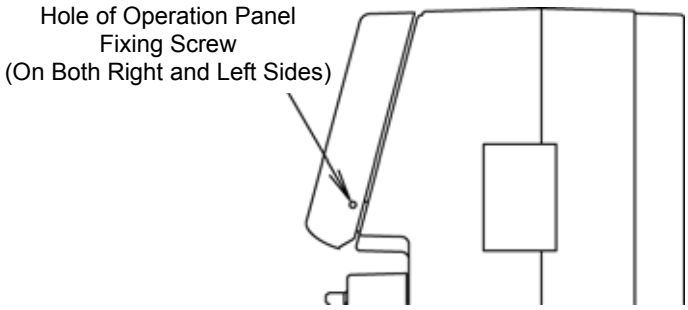


4. Re-install the backside panel in the order reverse to the above procedures. Ensure to connect the earth of the backside panel and the fan harness. When re-installling the backside panel, pass the cable for the color lamp through the recess at the circled portion in the right figure.
   Take caution not to catch the cable.



9.5. Releasing Hinge at Operation Panel

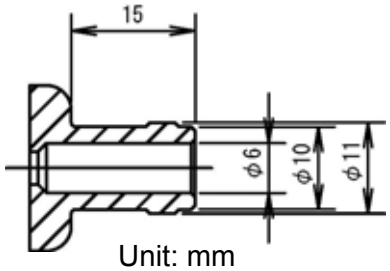
There are holes to unscrew the operating section fixing screws on both the right and left sides of the control panel. To release the hinge, insert the Phillips screwdriver into the holes (on the right and left sides) shown in the right figure and remove the fixing screws.



9.6. Connections to Water Supply Inlet and Drain Outlet

9.6.1. Dimensions of connectors at water supply inlet and drain outlet

The connectors for the water supply inlet and the drain outlet are as shown in the right figure.
When selecting a hose to use for water supply and drainage, select one in the dimensions suit for the connectors.



Unit: mm

9.6.2. Connecting the water supply hose

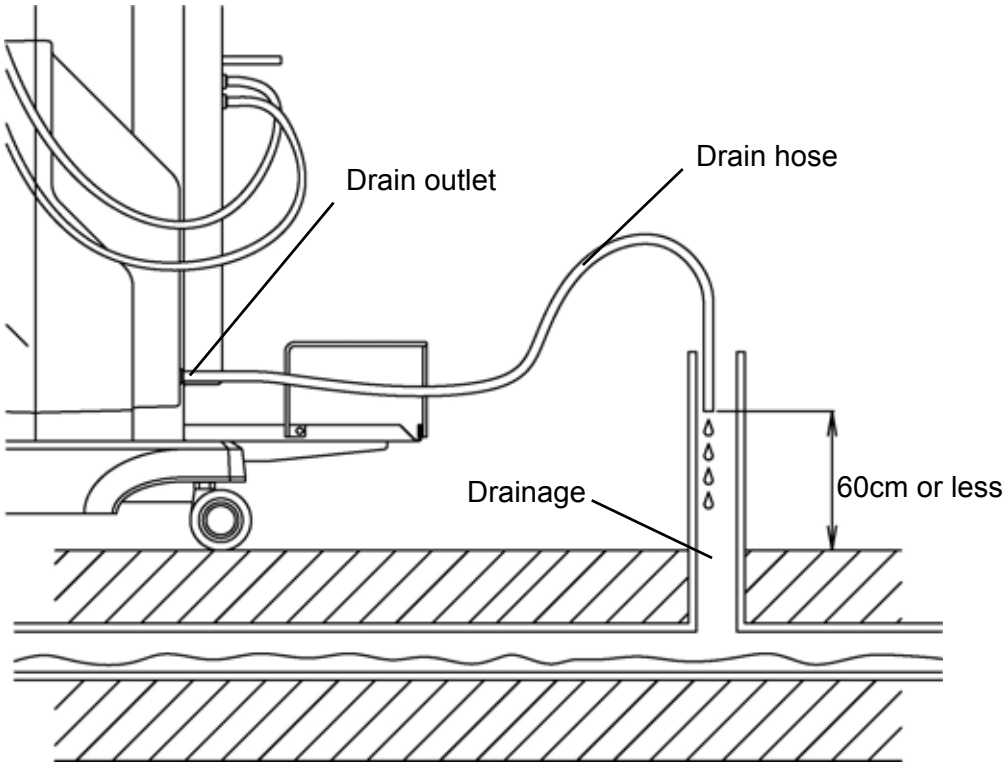
When connecting a hose that can resist water supply specifications to the water supply inlet, fully insert it to the depth of the inlet port and be sure to secure it with the hose band.

⚠ DANGER

Insert the hose to the distal end of the water supply opening. Use a hose band to secure the connection.

9.6.3. Connection to drain outlet

Use a hose for drain outlet equal to the one used for the water supply inlet.
When connecting a hose to the drain outlet, fully insert it to the depth of the outlet and be sure to secure it with the hose band.
Also, regulate the length of the drain tube within 3 meters and avoid connecting the hose with the drain outlet at the height of 60 cm or less from the floor level.



⚠ DANGER

Changes in the height of the drainage or clogging in the drain tube can cause errors in ultra filtration.

⚠ CAUTION

Install the drain system appropriately in accordance with your community rule.

9.6.4. Connecting the power plug

Securely insert the power plug to the depth of the specified outlet.

⚠ CAUTION

The power specification is noted on the machine nameplate and near the breaker. Be sure to apply the proper voltage when connecting to the machine.

⚠ CAUTION

Use the machine with equipotential grounding. If equipotential grounding cannot be established at an outlet at the installation location, use the equipotential grounding terminal at the rear of the machine. The terminal can be used only for equipotential grounding.

⚠ DANGER

Make sure that the electric power equipment at the installation location provides the voltage that is proper to the machine before connecting them. Improper voltage may cause serious accidents as well as machine malfunctions.

⚠ DANGER

If the protective grounding of the machine is incorrect, an electric shock due to a machine malfunction or short circuit may happen. Make sure that a double-pole-grounding outlet is correctly connected and protective grounding is assured at the installation location.

9.7. Preparing the system

9.7.1. Filling water in the hydraulic

Fill the dialysate line with water by executing the water supply program.

⚠ CAUTION

Execute the water supply program before operating the machine after its installation. When the machine is operated with water not filled in the dialysate line, the machine may be defected.

⚠ CAUTION

Take caution since water may spout out of the rinse / disinfectant nozzle while the water supply program runs. Before running water supply program, set rinse / disinfectant nozzle into bottle not to spill over.(The bottle containing the water of 200 mL or more is prepared.)

1. Verify the water supply inlet and the drain outlet are properly connected and water is sufficiently supplied.
2. Set rinse / disinfectant nozzle into bottle not to spill over (The bottle containing the water of 200 mL or more is prepared.).
3. Turn ON the Power Breaker.
   AC power supply lamp turns ON.
4. Press the Power ON/OFF switch for three seconds or more to turn ON the power supply of the machine.
   The lamp of the Power ON/OFF switch turns ON with the electronic sound. Then, the Startup test screen is displayed and the Rinse Standby screen appears after a while.
5. Log in to the machine in the MAKER mode. See "Chapter 14 TECHNICIAN MODE AND MAKER MODE" about the login method.
6. Press MENU button and select MAKER tab to open the Maker Maintenance screen.
7. Press WATER SUPPLY FUNCTION to display the Water Supply Program screen.
8. Press START button at the lower right section in the screen to start the water supply program.

   Hold the button pressed for approximately two seconds, then the filing water operation start.

NOTE

The color lamps blink in the order of "red → yellow → green → blue" while the water supply program runs.

9. The water supply program is made up of 9 steps in total, and completes less than 15 minutes. The chime will ring, informing the end of the program.
10. After all the steps complete, press EXIT button to restore the original screen.

9.7.2. Setting date and clock

The date and time of the machine are set to the Japan Standard Time on its shipment. Change them to suit for the country or region where the machine is installed before operating the machine.

1. Log in to the machine in the TECHNICIAN mode or the MAKER mode.
2. Press MENU button and select TECHNICIAN tab to open the Technician Maintenance screen.
3. Press OPTION–CLOCK SETTING to display the Date Setting screen.
4. Display the ten keys by touching the numerals to be changed, and set to the date and time in the region.
5. Press SET button at the lower section in the screen. Then, the input date and time will be reflected into the setting.
6. After all the settings are complete, press EXIT button to close the Setting screen.

Reference: Input procedure of 'WEEK'

Input Key	result
0	Sunday
1	Monday
2	Tuesday
3	Wednesday
4	Thursday
5	Friday
6	Saturday

9.7.3. Setting a diameter of pump segment in the blood pump

Select the diameter of a pump segment used for the bloodline set to the blood pump. Two options of pump segment (ϕ8.25 mm or ϕ6.35 mm) are available. The inner diameter is set to 8.25 mm on the shipment of the machine. Change the setting only when the diameter of the pump segment being used is ϕ6.35 mm.

1. Log in to the machine in the TECHNICIAN mode or the MAKER mode.
2. Press MENU button and select TECHNICIAN tab to open the Technician Maintenance screen.
3. Press CALIBRATION–BLOOD PUMP to open the setting screen for the blood pump.
4. Press the inner diameter button of a tube to be used.
5. Press EXIT button to restore the original screen

NOTE

If you change the setting to ϕ6.35 mm, calibration of Blood Pump is necessary. Please refer to Chapter 15.5 Blood Pump and follow the steps.

9.7.4. Setting the Syringe pump

By changing the setting of the syringe pump, it is possible to use the syringes other than the NIPRO product.
The heparin pump is set for the 10/20/30 mL syringes of NIPRO product on the shipment of the machine.

1. Log in to the machine in the TECHNICIAN mode or the MAKER mode.
2. Press MENU button and select TECHNICIAN tab to open the Technician Maintenance screen.
3. Press INITIAL DATA→HEPARIN to open the setting screen for the heparin pump.
4. Set an appropriate figure to RATIO for the setting of each 10/20/30mL syringe so that an appropriate flow rate is given to the syringe being used.

The heparin pump can be used for various syringes by setting the speed of the pusher of the NIPRO 20mL syringe to 100% and multiplying a certain coefficient to the speed of the syringe pusher by this setting item.

5. After the setting is complete, press EXIT button to restore the original screen.

NOTE

Setting of Heparin Pump, please refer to Chapter15 Setting of syringe ratio.

9.7.5. Setting the dialysate solution to be used

Register the dialysate solution to be used in this machine.

1. Prepare dialysate to be registered.
2. Log in to the machine in the TECHNICIAN mode or the MAKER mode.
3. Press MENU button and select TECHNICIAN tab to open the Technician Maintenance screen.
4. Press the CALIBRATION–DIALYSATE SOLUTION to open the setting screen for the dialysate.
5. Four dialysate (No. 1- No. 4) can be registered at maximum. Press the tab of the No. you want to register.
6. Select the concentrate type (BICARBO/ACETATE) of the dialysate to register.
7. Touch the empty frame below “SOLUTION” to call out the ten keys and input the name of the dialysate to register.
8. Touch the figure at “DILUTION” to call out the ten keys and input a specified dilution ratio of the dialysate to register. The dilution ratio also can be set by the input for the figure at “PREPARE RATIO” at the bottom in the screen.
9. Pull out both aspiration nozzles for dialysate A and B from the machine and put them into each dialysate prepared in Step 1.
10. Press and hold CALIBRATION button at the bottom in the screen to start the calibration of the dialysate. It completes less than 10 minutes.

NOTE

The color lamps blink in the order of “red → yellow → green → blue” during the calibration of the dialysate.

11. Register the other dialysate solution repeating Steps 5-10, if needed.
12. After required registration is complete, press EXIT button to restore the original screen.

9.8. Changing a PASS I.D.

This system has the factory default PASS I.D. when being shipped. After installing the system, ensure to change the PASS I.D. by referring to Chapter 14. TECHNICIAN Mode and MAKER Mode.

⚠ DANGER

In TECHNICIAN and MAKER modes, a wrong setting can cause machine malfunction as well as significant damage in the patient. Be sure to change the PASS I.D. after installing the machine. Manage the PASS I.D. under strict conditions.

9.9. Verifying operation after installation

When machine installation is complete, operate the system in the following mode to verify normal operation.

1. Operate the system in WATER RINSE for 30 min and verify the following:
   - Drainage flows continuously out of the DRAIN.
   - The process completes without errors.

2. Connecting to the dialysate solutions, operate the system in PREPARATION for approximately 30 min. Verify the following:
   - The temperature of the prepared dialysate is ±0.5 °C of the preset temperature.
   - The concentration of the prepared dialysate is ±0.3 mS/cm of the preset concentration.
   - The process completes without errors.

⚠ DANGER

Please rinse and disinfect the machine enough when all installation procedure complete.

9.10. Disposal of Machine

Following matters should be concerned when disposing the machine. Keep the following matters in mind and dispose the machine properly in accordance with the local regulation in your area.

9.10.1. Disposal of main machine

The primary materials composing the machine are electric circuit boards, harness, resins in rubber, exterior, etc., stainless/steel frames, and ceramics. Dispose these parts as industrial wastes or in accordance with the local regulation when applicable.

9.10.2. Disposal of LCD display

A fluorescent electrode tube is used in the LCD display. Dispose the display after checking if a disposal method is specified in your area.

9.10.3. Disposal of backup battery

The backup battery used in case of power failure is equipped as an option of this machine. It is a lead storage battery. Process the backup battery in accordance with the local regulation in your area.
Be sure to follow the following points when disposing the battery:

1. Do not throw the battery into fire or apply heat, as it may result in battery leakage, fire disaster, or explosion.
2. Electric energy yet remains in a used battery. Insulate a used battery to avoid interelectrode contact by taping battery terminals, harnesses, etc.
3. Do not apply strong impact on the battery by throwing or dropping.
4. Never disassemble the battery because the battery contains dilute sulfuric acid.

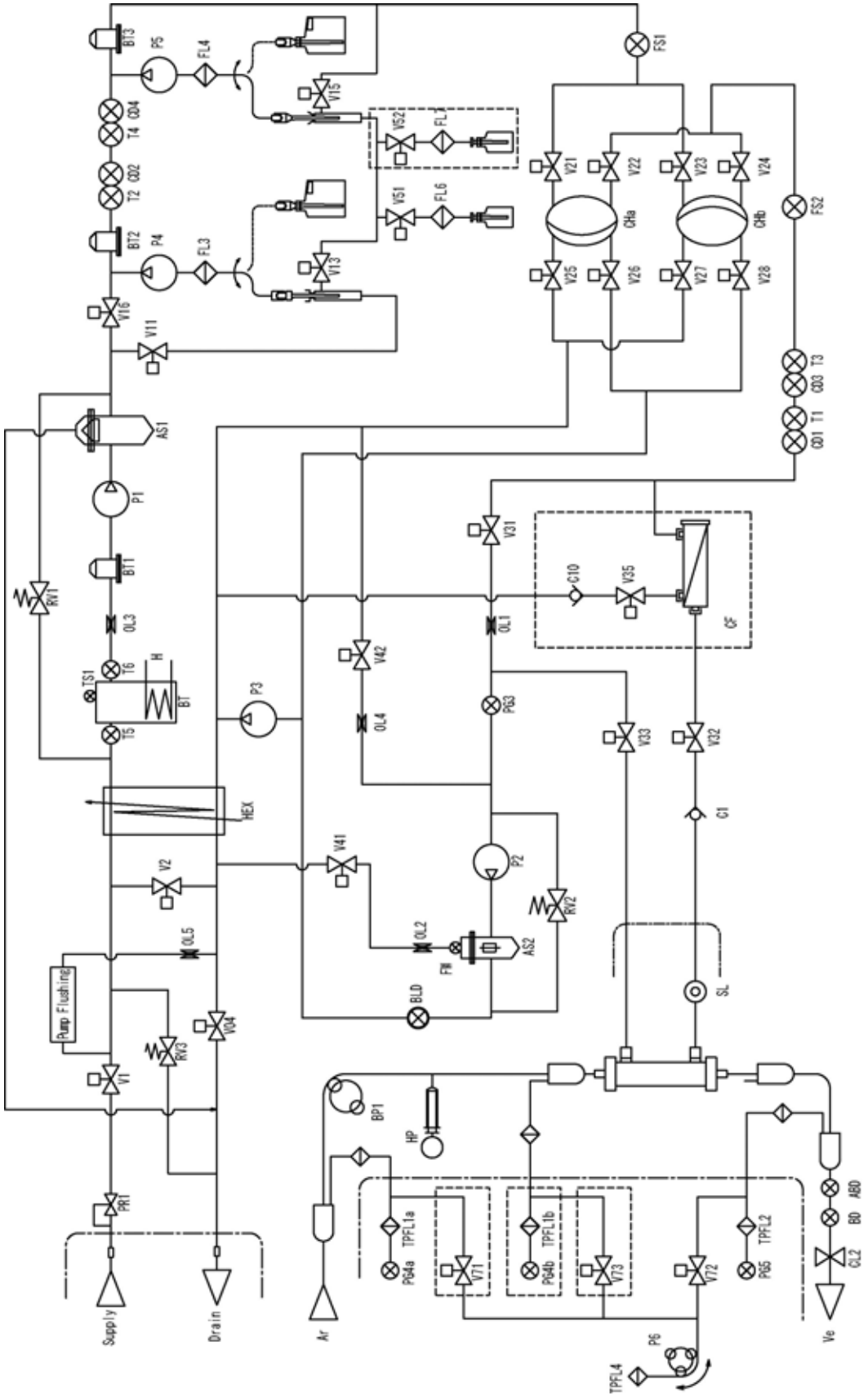
⚠ DANGER

If a battery damage results in leakage and electrolytic solution spills on skin or clothes, flush with plenty of water without delay. If the spilled electrolytic solution contacts the eye, flush with plenty of water and receive treatment from a doctor immediately. Dilute sulfuric acid can cause loss of sight and skin burn.

10 FLOWCHART

10.1. Dialysate Flow Chart (TYPE0)

Note) This flowchart is applicable to the models with serial No. 03A0001E to No. 04A0207E



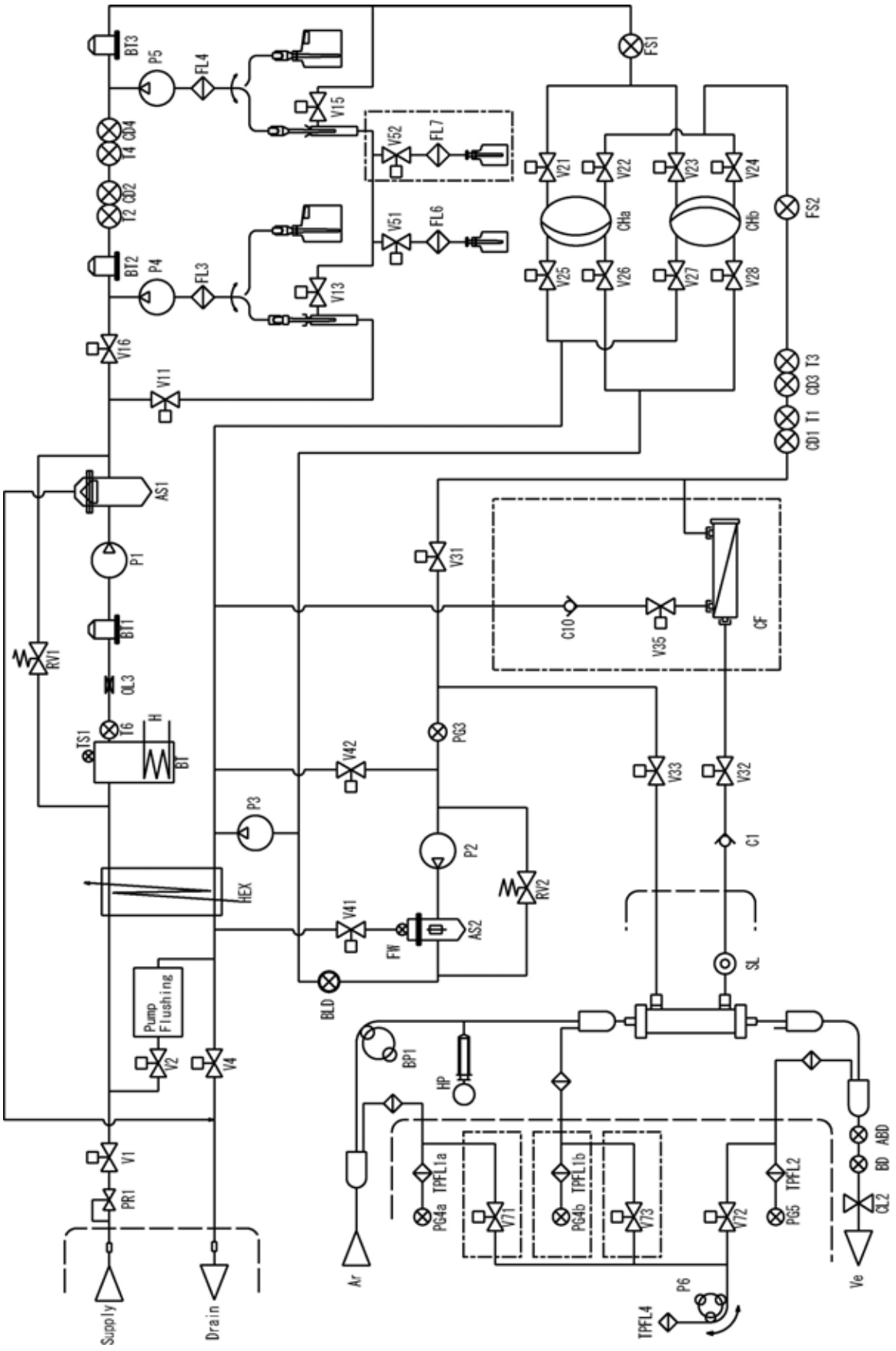
Symbol	Name	Symbol	Name
PR1	Pressure regulator	FL6	Filter 6
V1	Water inlet solenoid valve	V52	Disinfectant solenoid valve (OP)
HEX	Heat exchanger	FL7	Filter 7 (OP)
T5	Temperature sensor 5	FS1	Flow switch 1
T6	Temperature sensor 6	CHa	Chamber A
TS1	Thermostat	CHb	Chamber B
BT	Heater Tank	V21	CHa solenoid valve for filling fresh dialysate solenoid valve
H	Heater	V22	CHa solenoid valve for supplying fresh dialysate solenoid valve
OL3	Orifice 3	V23	CHb solenoid valve for filling fresh dialysate solenoid valve
BT1	Deaeration buffer tank	V24	CHb solenoid valve for supplying fresh dialysate solenoid valve
P1	Deaeration pump	V25	CHa solenoid valve for discharging drain solenoid valve
AS1	Deaeration tank	V26	CHa solenoid valve for filling drain solenoid valve
RV1	Relief valve 1	V27	CHb solenoid valve for discharging drain solenoid valve
V16	Water inlet solenoid valve	V28	CHb solenoid valve for filling drain solenoid valve
V11	Water inlet solenoid valve	FS2	Flow switch 2
BT2	Mixing tank	T1	Dialysate temperature sensor
T2	Temperature sensor for B concentrate	CD1	Dialysate conductivity sensor
T4	Temperature sensor for B concentrate	T3	Dialysate temperature sensor
CD2	Conductivity sensor for B concentrate	CD3	Dialysate conductivity sensor
CD4	Conductivity sensor for B concentrate	V31	Bypass solenoid valve
BT3	Mixing tank	OL1	Orifice 1
P4	B concentrate pump	PG3	Dialysate pressure sensor
FL3	Filter 3	C10	Check valve (OP)
P5	A concentrate pump	V35	Flushing solenoid valve (OP)
FL4	Filter 4	CF	Cut filter (OP)
V13	B drain solenoid valve	V32	Dialysate supply solenoid valve
V15	A drain solenoid valve	C1	Check valve

Symbol	Name	Symbol	Name
V51	Disinfectant solenoid valve	SL	Sample port
P2	Dialysate pump	V33	Dialysate return solenoid valve
RV2	Relief valve 2	PG4a	Arterial pressure sensor 1
AS2	Air separator tank	TPFL1a	Filter 1a
FW	Float switch	BP1	Blood pump
OL2	Orifice 2	HP	Syringe pump
V41	Air separator solenoid valve	P6	Blood chamber level adjustment pump
BLD	Blood leak detector	V72	Level adjustment solenoid valve
P3	UF pump	TPFL2	Filter 2
V2	Re-circulation solenoid valve	PG5	Venous pressure sensor
OL5	Orifice 5	ABD	Air bubble detector
OL4	Orifice 4	BD	Blood detector
V42	Pressure exhaust solenoid valve	CL2	Venous clamp
RV3	Relief valve 3	V73	Level adjustment solenoid valve (OP)
V4	Drain solenoid valve	V71	Level adjustment solenoid valve (OP)
		PG4b	Dialyzer inlet pressure sensor (OP)
		TPFL1b	Filter 1b

NOTE : (OP)・・・・Options

10.2. Dialysate Flow Chart (TYPE 1)

Note) This flowchart is applicable to the models with serial No. 04A0208E or later.



Symbol	Name	Symbol	Name
PR1	Pressure regulator	V52	Disinfectant solenoid valve (OP)
V1	Water inlet solenoid valve	FL7	Filter 7 (OP)
HEX	Heat exchanger	BT3	Buffer tank
T6	Temperature sensor 6	FS1	Flow switch 1
TS1	Thermostat	CHa	Chamber A
BT	Heater Tank	CHb	Chamber B
H	Heater	V21	CHa solenoid valve for filling fresh dialysate solenoid valve
OL3	Orifice 3	V22	CHa solenoid valve for supplying fresh dialysate solenoid valve
BT1	Deaeration buffer tank	V23	CHb solenoid valve for filling fresh dialysate solenoid valve
P1	Deaeration pump	V24	CHb solenoid valve for supplying fresh dialysate solenoid valve
AS1	Deaeration tank	V25	CHa solenoid valve for discharging drain solenoid valve
RV1	Relief valve 1	V26	CHa solenoid valve for filling drain solenoid valve
V16	Water inlet solenoid valve	V27	CHb solenoid valve for discharging drain solenoid valve
V11	Water inlet solenoid valve	V28	CHb solenoid valve for filling drain solenoid valve
BT2	Mixing tank	FS2	Flow switch 2
T2	Temperature sensor for B concentrate	T3	Dialysate temperature sensor
CD2	Conductivity sensor for B concentrate	CD3	Dialysate conductivity sensor
T4	Temperature sensor for B concentrate	T1	Dialysate temperature sensor
CD4	Conductivity sensor for B concentrate	CD1	Dialysate conductivity sensor
P4	B concentrate pump	V31	Bypass solenoid valve
FL3	Filter 3	C10	Check valve (OP)
P5	A concentrate pump	V35	Flushing solenoid valve (OP)
FL4	Filter 4	CF	Cut filter (OP)
V13	B drain solenoid valve	V32	Dialysate supply solenoid valve
V15	A drain solenoid valve	C1	Check valve
V51	Disinfectant solenoid valve	SL	Sample port
FL6	Filter 6	V33	Dialysate return solenoid valve

Symbol	Name	Symbol	Name
AS2	Air separator tank	PG4a	Arterial pressure sensor 1
RV2	Relief valve 2	TPFL1a	Filter 1a
FW	Float switch	V71	Level adjustment solenoid valve (OP)
V41	Air separator solenoid valve	BP1	Blood pump
V42	Pressure exhaust solenoid valve	HP	Syringe pump
BLD	Blood leak detector	TPFL1b	Filter1 (OP)
P3	UF pump	PG4b	Dialyzer inlet pressure sensor (OP)
PG3	Dialysate pressure sensor	V73	Level adjustment solenoid valve (OP)
P2	Dialysate pump	TPFL4	Filter 4
V2	Re-circulation solenoid valve	P6	Blood chamber level adjustment pump
V4	Drain solenoid valve	V72	Level adjustment solenoid valve
		TPFL2	Filter 2
		PG5	Venous pressure sensor
		ABD	Air bubble detector
		BD	Blood detector
		CL2	Venous clamp

NOTE: (OP)・・・・Options

NOTE: Some TYPE 1model have ‘Orifice 2’ and ‘Orifice 4’ in the dialysate flow chart.
Serial No. of these models can confirm in the table 1.

Model Type	Serial No.
Orifice model	04A0208 – 06A0389, 06A0391 06B0392 – 06B0402, 0458, 0541, 06A0422 – 06A0425, 0512, 0513
No Orifice model	Other than Type 1 models those above

11 REPLACEMENT OF PARTS

11.1. Replacement Parts List for Maintenance

(Replacement interval: A: Annually, B: Every 2 years, C: Every 4 years, D: At failure)

Assembly	Item No. / STD. and Symbol	Description	Replacement Interval				Remarks
			A	B	C	D	
Supply / Drainage part	PR1	Pressure regulator				●	
	HEX	ASS'Y				●	
		T different diameter joint				●	
Deaeration tank	AS1	ASS'Y				●	
		O ring		●			
Air separator tank	AS2	ASS'Y				●	
		Packing		●			
		O ring		●			
		Float switch		●			
Mixing Chamber		ASS'Y				●	
		O ring		●			
Temperature sensor	T1－4(type1)	ASS'Y				●	For Type 1 DIAMAX.
		Pt 100 probe				●	
		O ring		●			
	T1－4(type2)	ASS'Y				●	For Type 2 or 3 DIAMAX.
		Thermistor with holder lid				●	
		O ring		●			
	T5, 6	ASS'Y				●	
		Thermistor with holder lid				●	
		O ring		●			
Conductivity sensor	CD1-4	ASS'Y				●	
		O ring		●			
Heater	H	Heater Assy				●	
		O ring		●			
Chamber unit	Cha/CHb	ASS'Y				●	
Flow Switch	FS1-2	Flow switch				●	
		O ring		●			
Dialysate press. Sensor	PG3(type1)	ASS'Y				●	
		O ring		●			
	PG3(type2)	ASS'Y				●	
		O ring		●			
Filter	FL3,4,6	Filters (liquid flow sections)	●				
Deaeration pump	P1	Gear pump				●	
Dialysate pump	P2	Gear pump				●	
	P1/P2	Pump head		●			
UF pump	UFP	Hicera pump (Piston pump)				●	
		Lip seal	●				Annually or Every 3500 hours

(Replacement interval: A: Annually, B: Every 2 years, C: Every 4 years, D: At failure)

Assembly	Item No. / STD. and Symbol	Description	Replacement Interval				Remarks
			A	B	C	D	
Concentrate pump	P4	Hicera pump (Piston pump)				●	
		Lip seal	●				Annually or Every 3500 hours
	P5	Hicera pump (Piston pump)				●	
		Lip seal	●				Annually or Every 3500 hours
Valves	V	2-way solenoid valve				●	V51/V52 excluded.
	V51/V52	2-way solenoid valve (disinfectant port)		●			V52 is option
	CV	Check valve				●	
	RV1-3	Relief valve				●	
Blood leak detector	BLD	Blood leak detector unit				●	
Coupler		Coupler (blue)				●	
		Coupler (red)				●	
		Check valve(※)				●	Duck bill type
Sample Port	SL	Sample port				●	
		Packing		●			
Concentrate nozzle		A conc. Nozzle ASS'Y				●	
		O ring	●				
		B conc. Nozzle ASS'Y				●	
		O ring	●				
Piping part		Silicon tube		●			Disinfectant line
		Silicon tube				●	Excluding disinfectant line
Blood pump	BP	ASS'Y				●	
		Roller Assy			●		
Clamp part	CL	ASS'Y				●	
Blood sensor	BD	ASS'Y				●	
Air bubble detector	ABD	ASS'Y				●	
Syringe pump	HP	ASS'Y				●	
		Half nut			●		

※) If you don't use HOT RINSE Program usually, you can replace only in a failure.

(Replacement interval: A: Annually, B: Every 2 years, C: Every 4 years, D: At failure)

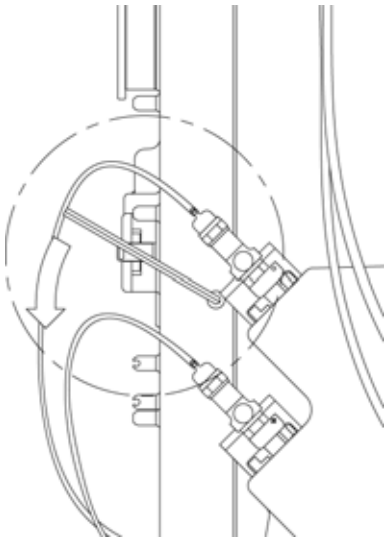
Name	Item No. / STD. and Symbol	Item Name	Replacement Interval				Remarks
			A	B	C	D	
Electrical equipment (P.C. board)	BP02-16 BP05-12	Control P.C. board				●	
		Backup button battery				●	
	BP02-17 BP05-13	Monitor P.C. board				●	
	BP02-18 BP05-14	Driver P.C. board				●	
	BP02-14 BP05-11	Mother P.C. board				●	
	BP02-15	LCD display P.C. board				●	
	BP01-25	LED LAMP P.C. board				●	
	BP02-31	Connector P.C. board				●	
	BP02-30	LCD connector conversion P.C. board				●	
	BP03-10	Pump driver P.C. board				●	
	BP03-16	Conductivity sensor P.C. board				●	
	BP03-01	Dialysate pressure sensor P.C. board				●	
	BP01-19	Blood pressure sensor P.C. board				●	
	BP01-24	Sound volume P.C. board				●	
	BP01-50	Level adjustment switch P.C. board				●	
	BP05-34	UFP Encoder P.C. board				●	
		Air bubble detector P.C. board				●	
		Inverter P.C. board				●	
Electrical equipment (Excluding P.C. board)		Membrane switch seat				●	
		Touch panel				●	
		Liquid crystal display				●	
		Power supply				●	
		Battery	●				
		Cooling fan				●	
		Hour meter				●	
		Level adjustment pump				●	
		Micro switch				●	

11.2. Maintenance of Each Part

11.2.1. Maintenance of bottom part of machine

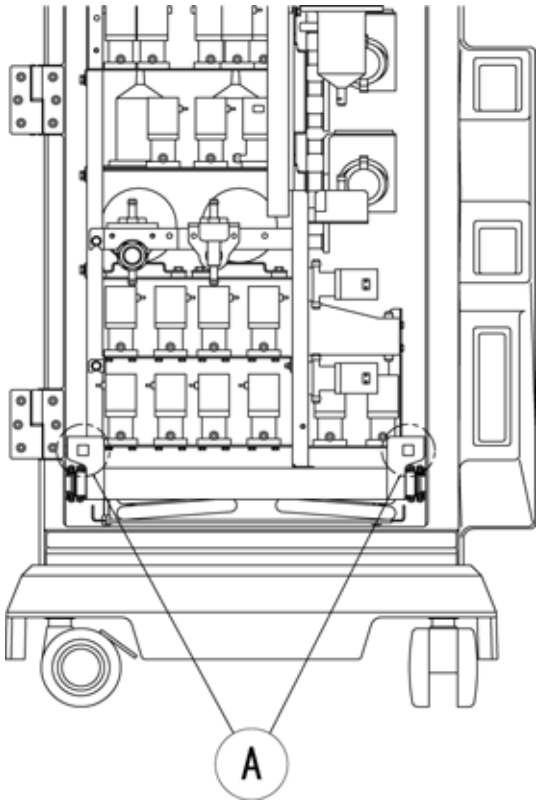
Service the dialysate line and the rear part of the front door in the following procedures.

11.2.1.1 Method to open the front door and draw out the dialysate line



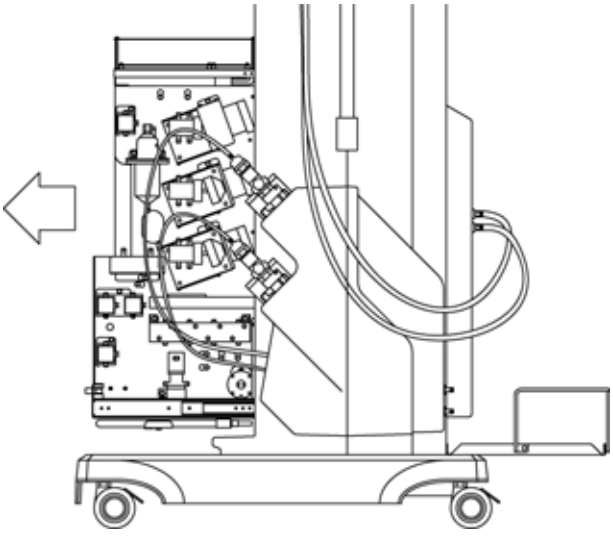
1. Insert an Allen wrench (8mm) to the hole on the right side of the front door and turn it in the arrow direction shown in the right figure.

2. Open the front door.



3. Press the buttons at two latches at Section A in the left figure simultaneously to release them.

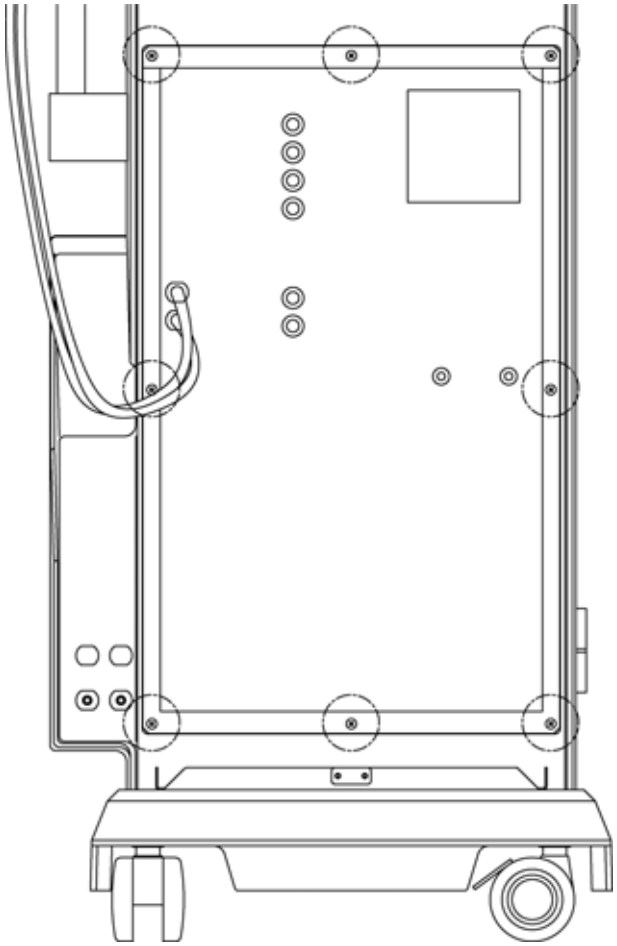
4. Draw out the dialysate line forward.



11.2.1.2 Method to remove the backside cover of the dialysate line section

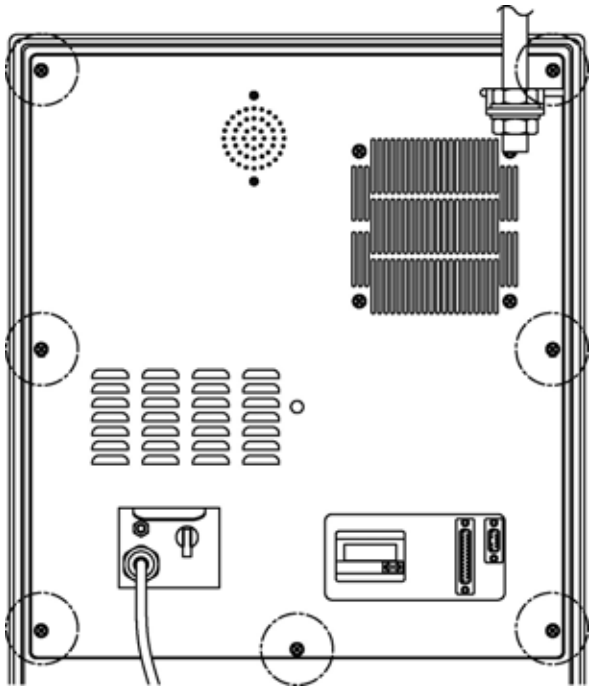
1. Unscrew the 8 screws placed in the right figure using the Phillips screwdriver.

2. Disconnect the connector of the fan mounted at the backside cover of the dialysate line section.

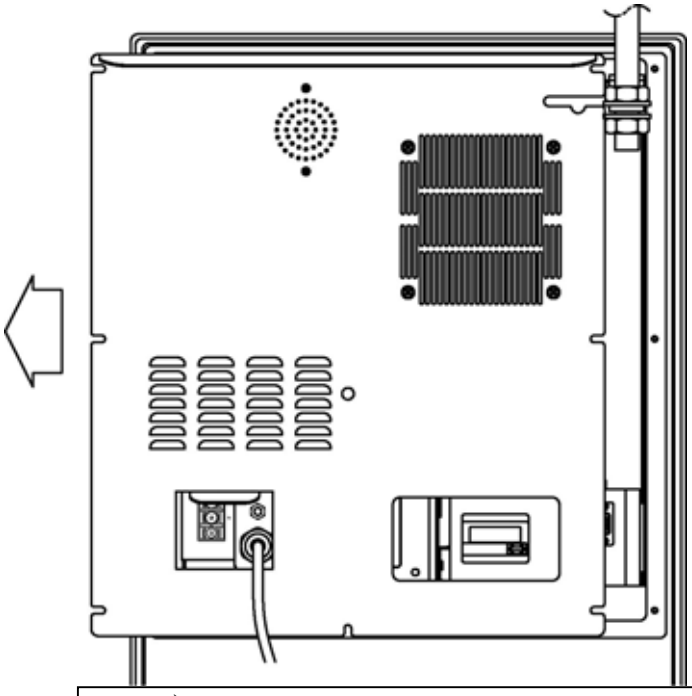


11.2.2. Method to remove the backside cover of the power supply section

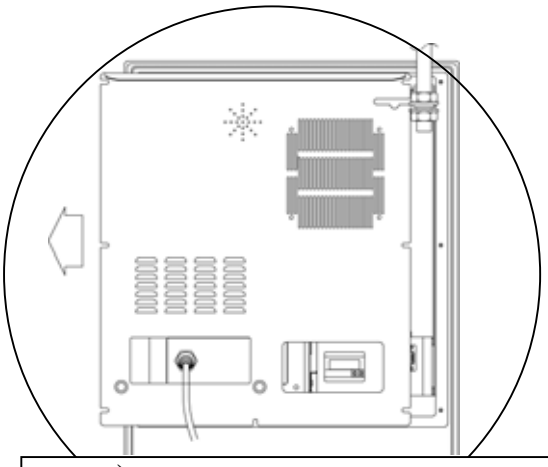
1. Unscrew the 7 screws placed in the right figure.



2. Remove the backside cover at the power supply section by carefully sliding it in the arrow direction so as not to damage the wiring for the color lamp.
   The earth cable and the harnesses of the each component are connected to the backside cover.
   Turn over the backside panel so as not to damage the power cable and disconnect the connector of the fan and then remove the earth cable.



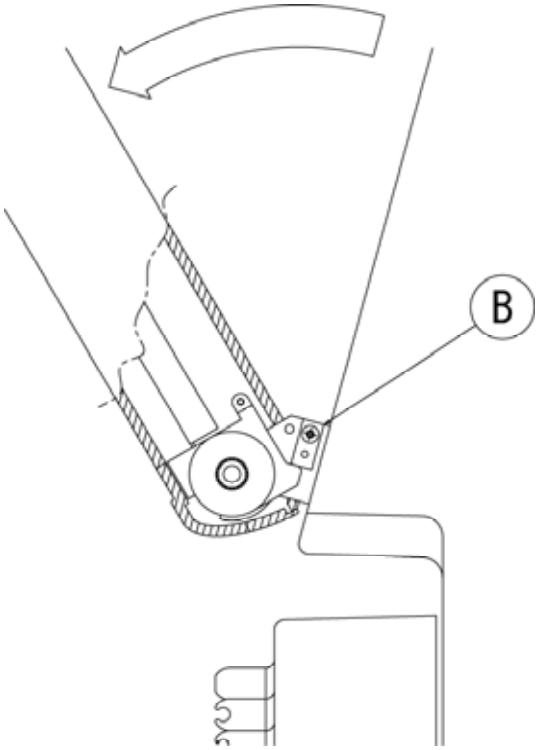
NOTE） This type of Rear cover is equipped the models with serial No.04A0208E or later.

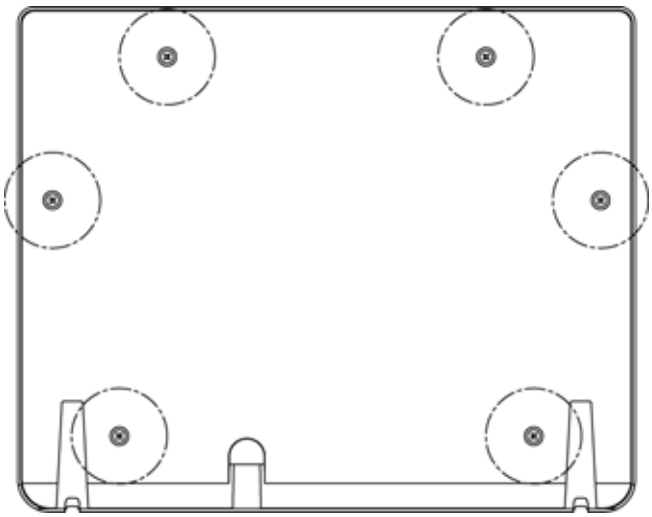


NOTE） This type of Rear cover is equipped the models with serial No.03A00001E～ No.04A0207E

11.2.3. Method to remove the rear cover at the operating panel

1. Lean the operating panel forward and remove the stopper (Portion B in the right figure) at the hinges on both the right and left sides.





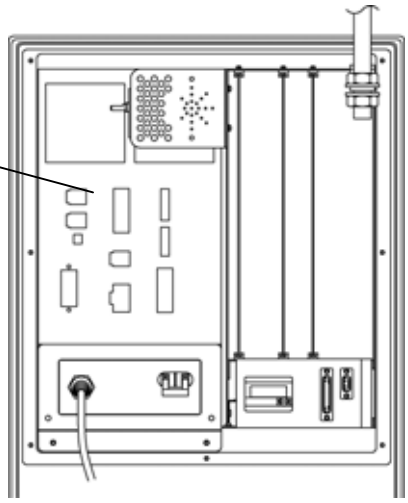
2. Unscrew the 6 screws placed in the right figure to remove the rear cover of the operating panel.

11.3. Distinction about types of DIAMAX

TYPE 1

Big size Power Supply Unit
(**Type 1**)
(Manufactured by Techno Electric.)

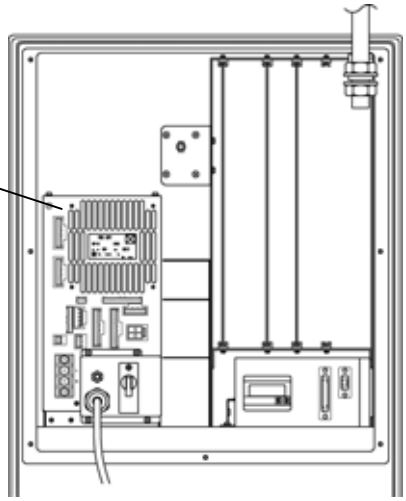
Serial No.: 03A0001E - 04A0207E



TYPE 2

Small size Power Supply Unit
(**Type 2**)
(Manufactured by Voltex.)

Serial No.: 04A0208E –
06A(or B) 0609E(or S)



TYPE 3

SSR – Box

Small size Power Supply Unit
(**Type 3**)
(Manufactured by Voltex.)

EMC Shield Cover

Serial No.: 06C(or D) 0001E(or S)
or later

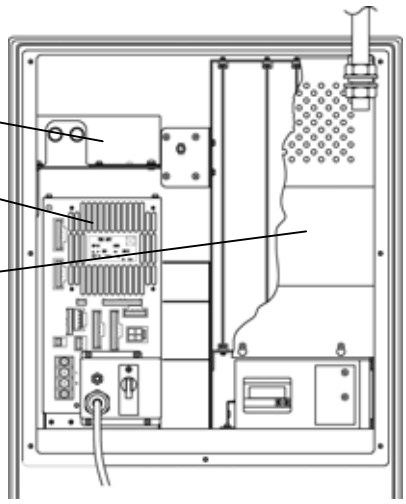


Table 1: Distinction matter of Machines

Item	TYPE 1 (Big size PS)	TYPE 2 (Small size PS)	TYPE 3 (With SSR-Box)
Serial No.	03A0001E - 04A0207E	04A0208E – 06A(or B) 0609E(or S)	06C(or D) 0001E(or S) or later
Power Supply Unit	Type 1 Manufactured by Techno Electric. (Big size PS)	Type 2 Manufactured by Voltex. (Small size PS: SSR is integrated)	Type 3 Manufactured by Voltex. (Small size PS: SSR is **NOT** Integrated)
SSR-Box	Not Equipped	Not Equipped	Equipped
Pressure Regulator PR1	Type 1 (ER884ZB)	Type 2 (PVS / JX-3839C)	Type 2 (PVS / JX-3839C)
Temperature Sensor T1-4 (See Table 2)	Type 1 (Pt100)	Type 2 (Thermistor)	Type 2 (Thermistor)
Monitoring Board	BP02-17B	BP02-17C	BP05-13A
Temperature Sensor T5	Equipped	Not equipped	Not equipped
UF Pump P3 (See Table 2)	Type 1 (Separate Bracket)	Type 2 (Integrated Bracket)	Type 2 (Integrated Bracket)
UFP Encoder (See Table 2)	Type 1 Monitoring volume only	Type 1 Monitoring volume only	Type 2 Monitoring volume and rotate direction of pump
Concentration Pump P4	Type 1 (Separate Bracket)	Type 2 (Integrated Bracket) (P4 is compatible with P5)	Type 2 (Integrated Bracket) (P4 is compatible with P5)
Concentration Pump P5	Type 1 (Separate Bracket)		
Relief Valve RV3 (Hydraulic Type: See Table 2)	Equipped	Not equipped	Not equipped
Dialyzer Coupler Holder	Type 1 (Vertical type)	Type 1 (Vertical type)	Type 2 (Horizontal Type)
Heater (See Table 2)	Single Heater (1500W)	Single Heater (1500W)	230V: Double Heater (750W+750W)
			110V: Single Heater (1500W)

Item	TYPE 1 (Big size PS)	TYPE 2 (Small size PS)	TYPE 3 (With SSR-Box)
Heater Tank	Type 1	Type 1	Type 2
Blood Sensor amp BD	Type 1 (SUNX FX-D1)	Type 2 (SUNX FX-301)	Type 2 (SUNX FX-301)
Blood Leak Detector BLD (See Table 2 below)	Type 1	Type 1	Type 2
Pressure Sensor Bracket PG3	Type 1 Before or equal 06A0389 E(or S), 06A391-0402 E(or S), 422-425 E(or S), 458 E(or S)		Type 2 06A0390, 06A0403-421 E(or S), 426-457 E(or S), 459* E(or S)or later
Solenoid Two-way Valve	Type 1 (CKD) Before or equal 06A0389 E(or S), 06A391-0402 E(or S), 422-425 E(or S), 458 E(or S)		Type 2 (KYOWA) 06A0390 E(or S), 06A0403-421 E(or S), 426-457 E(or S), 459 E(or S)or later
Blood Pump Cover	Old Type before or equal 03A0100E.	03A00101E or later	

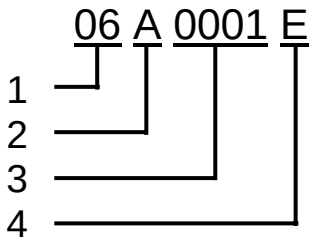
Table 2: Software Type Setting List

Item	TYPE 1 (Big size PS)	TYPE 2 (Small size PS)	TYPE 3 (With SSR-Box)
Serial No.	03A0001E - 04A0207E	04A0208E – 06A(or B) 0609E(or S)	06C(or D) 0001 E(or S) or later
Type of Temperature Sensor T1-4	Setting on Software: Maker - Information – Machine type – Temperature sensor		
	Type 0	Type 1	Type 1
UFP Encoder	Setting on Software: Maker - Information – Machine type – UFP		
	Type 1	Type 1	Type 2
Hydraulic Type	Setting on Software: Maker - Information – Machine type – Hydraulic		
	Type 0	Type 1	Type 1
	Setting on Software: Technician – Rinse – Parameter Setting – Recirculation Rate		
	600 mL /min	1300 mL /min	1300 mL /min
Heater	Setting on Software: Maker - Information – Machine type – Heater		
	Type 1	Type 1	230V: Type 2 110V: Type 1
Blood Leak Detector	Setting on Software: Maker - Information – Machine type – BLD		
	Type 0	Type 0	Type 1

Table 3: List of P.C. Board and machine Types

Machine TYPE	TYPE 1	TYPE 2	TYPE 3
Control P.C. board	BP02-16B		BP05-12A/12B
Monitor P.C. board	BP02-17B	BP02-17C	BP05-13A/13B
Driver P.C. board	BP02-18B		BP05-14A
Mother P.C. board	BP02-14A		BP05-11A
LCD display P.C. board	BP02-15A/15B/15C		BP02-15D
LED LAMP P.C. board	BP01-25		
Connector P.C. board	BP02-31A/31B		BP02-31C
LCD connector conversion P.C. board	BP02-30		
Pump driver P.C. board	BP03-10A/10B		
Conductivity sensor P.C. board	BP03-16A/16B		BP03-16C
Dialysate pressure sensor P.C. board	BP03-01A/01B		BP03-01C
Blood pressure sensor P.C. board	BP01-19B		BP-19C
Sound volume P.C. board	BP01-24		
Level adjustment switch P.C. board	BP01-50 (White Key top)		BP01-50 (Gray Key top)
Air bubble detector P.C. board	23SD-543	26SD-520A	
Inverter P.C. board	CXA-P1212B-WJL		
UFP Encoder board			BP05-34

NOTE: meaning of Serial No.



	Description	Remarks
1	Year of manufacture	'06' means manufactured in 2006.
2	Type of voltage	A or C: 230V
		B or D: 110V
3	Serial No. Compliance to EMC	06A (or B) 0001-: No compliance to EMC
		06C (or D) 0001-: Compliance to EMC
4	Language	E: English S: Spanish

11.4. The Parts – Parts List and Replacement Procedure

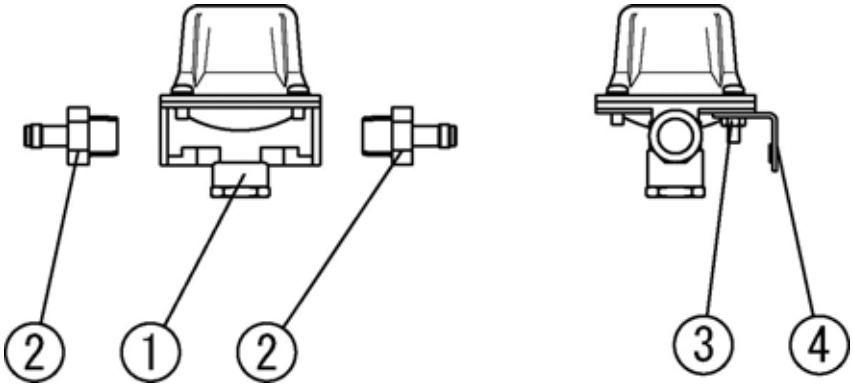
NOTE

The standards and materials described in the table below are based on JIS standard.

11.4.1. Pressure Regulator (PR)

11.4.1.1 Pressure Regulator (Type 1)

NOTE） This type of Pressure Regulator is equipped the models with equal or before serial No.04A0207E

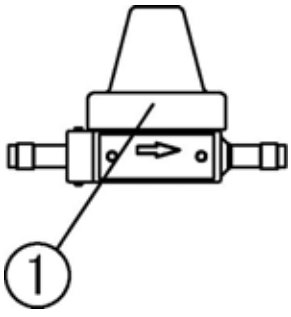


No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Pressure Regulator Assy				Compatible with Type2 (0-401-001)
1	Pressure Regulator body	ER884ZB	0-401-	002	
2	Joint (Hose port)	PSU			
3	Nut	Stainless Steel	0-401-	004	
4	PR bracket	Stainless Steel			

NOTE） The parts with hatched on the list above constitute as an assembly, and cannot be purchased separately.

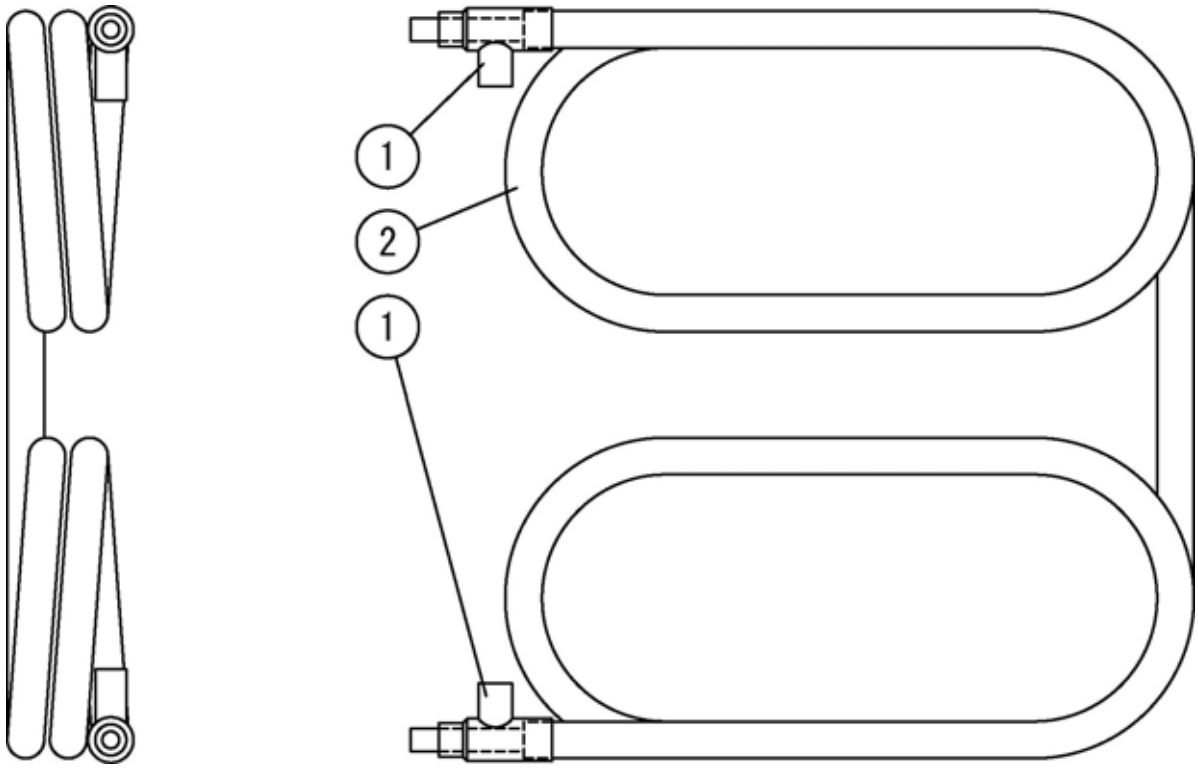
11.4.1.2 Pressure regulator (Type 2): Non adjustment type

NOTE） This type of Pressure Regulator is equipped the models with serial No.04A0208E or later.



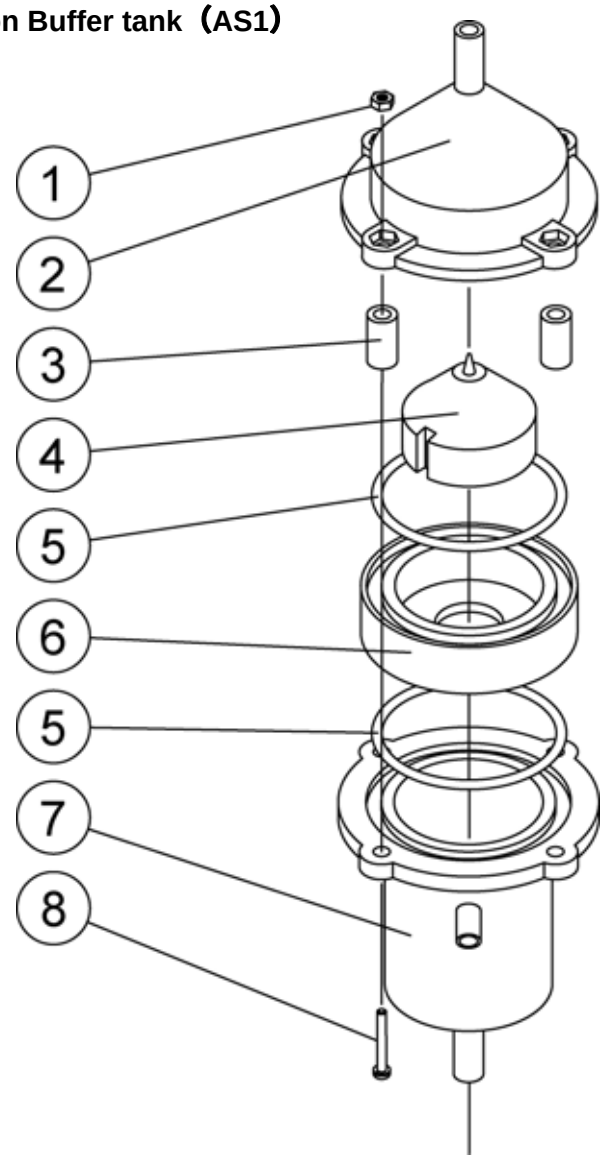
No.	Description	Standard /Material	NIPRO order Code No.		Remarks
1	Pressure Regulator Assy	PVS/JX-3839C	0-401-	001	Compatible with Type 1

11.4.2. Heat exchanger (HEX)



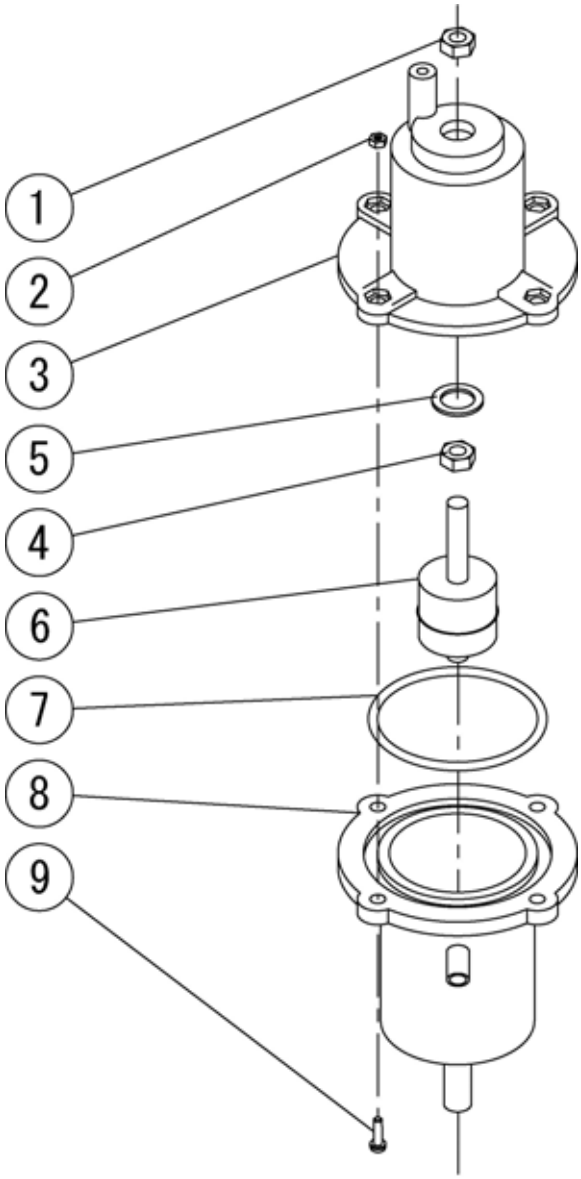
No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Heat exchanger Assy		0-401-	006	
1	T different diameter joint	Silicone rubber	0-401-	007	
2	Double tube	Stainless Steel	0-401-	008	

11.4.3. Deaeration Buffer tank（AS1）



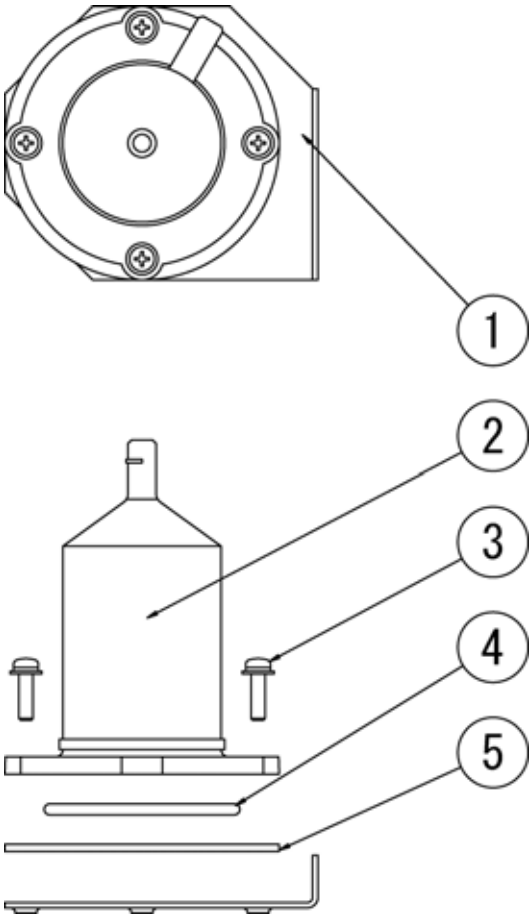
No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Deaeration tank Assy		0-401-	009	
1	Hex. nut	M4	0-401-	010	
2	Upper tank	PSU	0-401-	011	
3	Spacer	4EP	0-401-	012	Equipped with after or equal 04B0218S.
4	Float	PP Stainless Steel	0-401-	013	
5	O ring	G50 silicone rubber	0-401-	014	
6	Large Spacer	PPS	0-401-	015	Equipped with after or equal 04B0218S.
7	Lower tank	PSU	0-401-	016	
8A	Cross recessed head pan screw	P3 M4×15	0-401-	017	
8B	Cross recessed head pan screw	P3 M4×30	0-401-	018	Equipped with after or equal 04B0218S.

11.4.4. Air separator tank（AS2）



No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Air separator Assy		0-401-	019	
1	Hex. nut	M6	0-401-	020	Float switch accessory
2	Hex. nut	M4	0-401-	010	
3	Upper tank	PSU	0-401-	021	
4	Hex. nut	M6	0-401-	020	Float switch accessory
5	Packing	Silicone rubber	0-401-	022	
6	Float switch	OLV-5S	0-401-	023	
7	O ring	G50 silicone rubber	0-401-	014	
8	Lower tank	PSU	0-401-	016	
9	Cross recessed head pan screw	P3 M4×15 Stainless Steel	0-401-	017	

11.4.5. Deaeration chamber (BT1)



No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Deaeration chamber Assy		0-401-	024	
1	Chamber bracket	Stainless Steel	0-401-	025	
2	Lower tank	PSU	0-401-	016	
3	Cross recessed head pan screw	P3 M4×15	0-401-	017	
4	O ring	G50 silicone rubber	0-401-	014	
5	Tank cap	Stainless Steel	0-401-	026	

11.4.6. Temperature sensor（T1 to 4）

11.4.6.1 Temperature sensor（T1 to 4）（Type 1:Pt 100Ω）

NOTE

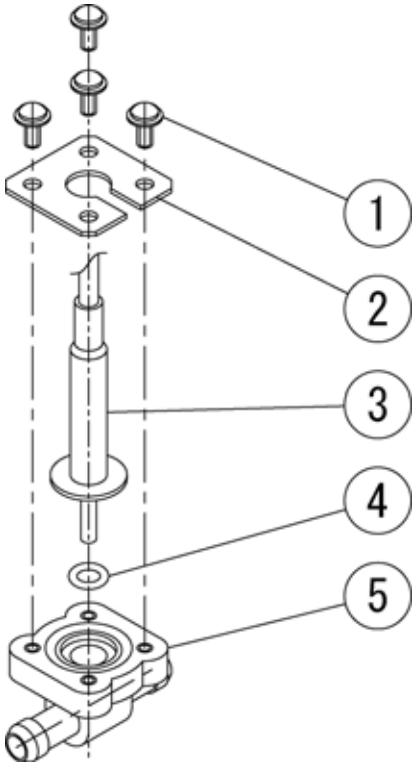
Monitor PCB (Slot 3: CPU2 board) version should be **BP02-17A or B** type (it is equipped with serial No **before or equal 04A0207E**). Not compatible with BP02-17C or later version that is for Thermistor types (it is equipped with equal or after 04A0208E)

NOTE

Software setting of temperature sensor that “Maker”>”Machine type”>”Temperature sensor” should be selected “**0**”. “1” is for Thermistor type.

⚠CAUTION

This Pt 100 type does **not compatible** with thermistor
This Pt 100 type does **not compatible** with T5/6 thermistor



No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Temperature sensor Pt 100 type Assy	Pt100	0-401-	027	
1	Cross recessed head pan screw	Stainless Steel P3 M3×10	0-401-	028	
2	Thermo sensor holder lid	Stainless Steel	0-401-	029	
3	Pt 100 probe	Pt100	0-401-	030	
4	O ring	P5 silicone rubber	0-401-	031	
5	Thermo sensor holder	PSU	0-401-	032	

11.4.6.2 Temperature sensor（T1 to 4） （Type 2:Thermistor）

NOTE

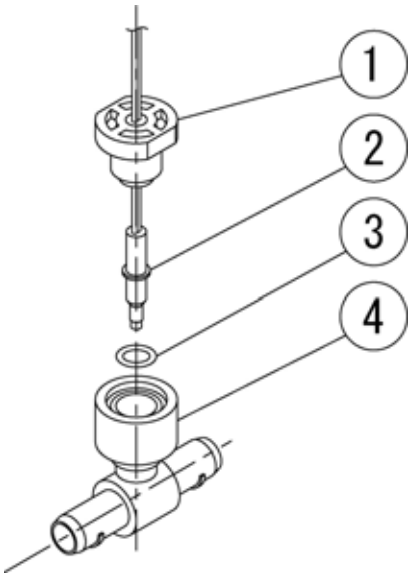
Monitor PCB (Slot 3: CPU2 board) version should be equal or **after BP02-17C** (This PCB is equipped the model with serial No. **04A0208E or later.**). Not compatible with BP02-17A or B type that is for Pt 100 sensor types (it is equipped with serial No. before or equal 04A0207E)

NOTE

Software setting of temperature sensor that "Maker">"Machine type">"Temperature sensor" should be selected "**1**". "0" is for Pt 100 type.

⚠CAUTION

This thermistor does **not compatible** with Pt 100 type sensor.
This thermistor does **not compatible** with T5/6 thermistor.



No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Temperature sensor Thermistor (T1 to T4) Assy	EP5G503E2	0-401-	033	
1	Thermistor holder lid	PSU	0-401-	034	1 and 2 costitute an assembly
2	Thermistor		0-401-	034	1 and 2 costitute an assembly
3	O ring	P3 silicone rubber	0-401-	035	
4	Thermistor holder	PSU	0-401-	036	

NOTE） Since the parts with hatched "No." on the list above constitute as an assembly, each part cannot be purchased separately.

11.4.6.3 Temperature sensor（T5/6）

NOTE

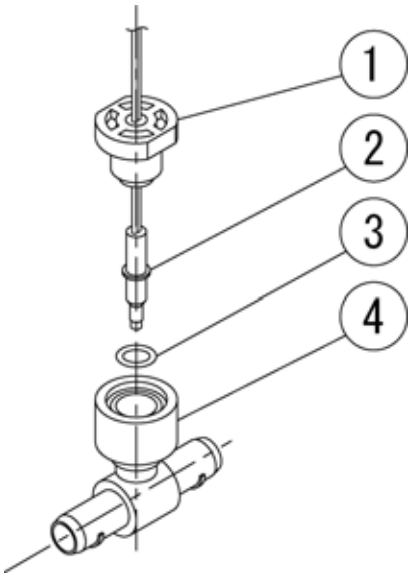
T5 is not equipped the models with serial No**.04A0208E or later.**

⚠CAUTION

This temperature sensor does **not compatible** with T1 to T4 temperature sensor.

⚠CAUTION

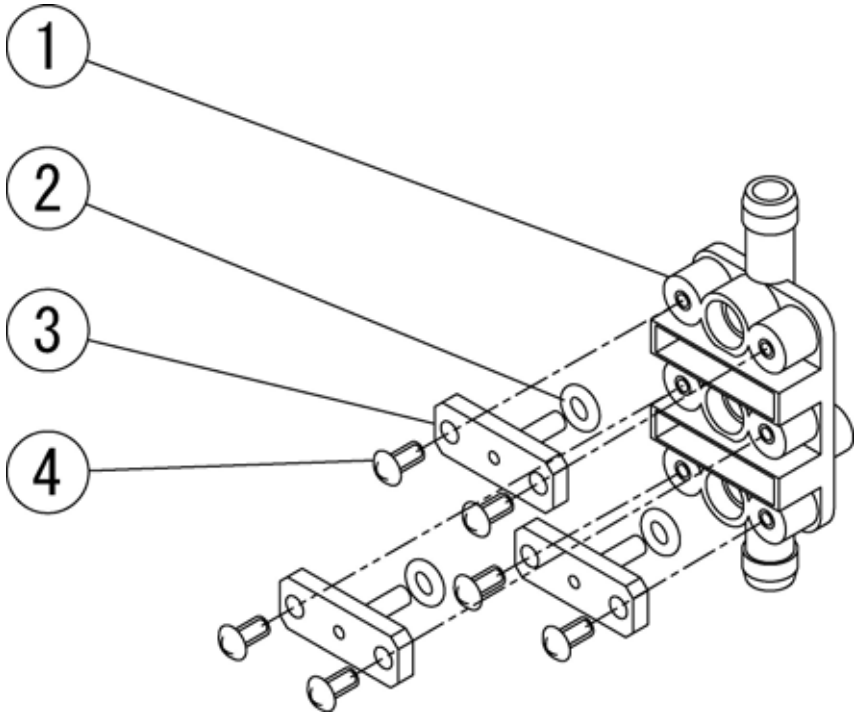
This sensor (Thermistor type) does **not compatible** with Pt 100 type sensor.



No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Thermistor (T5 or T6) Assy	EP5H852LT	0-401-	037	
1	Thermistor holder lid	PSU	0-401-	038	1 and 2 constitute as an assembly
2	Thermistor		0-401-	038	1 and 2 constitute as an assembly
3	O ring	P3 silicone rubber	0-401-	035	
4	Thermistor holder	PSU	0-401-	036	

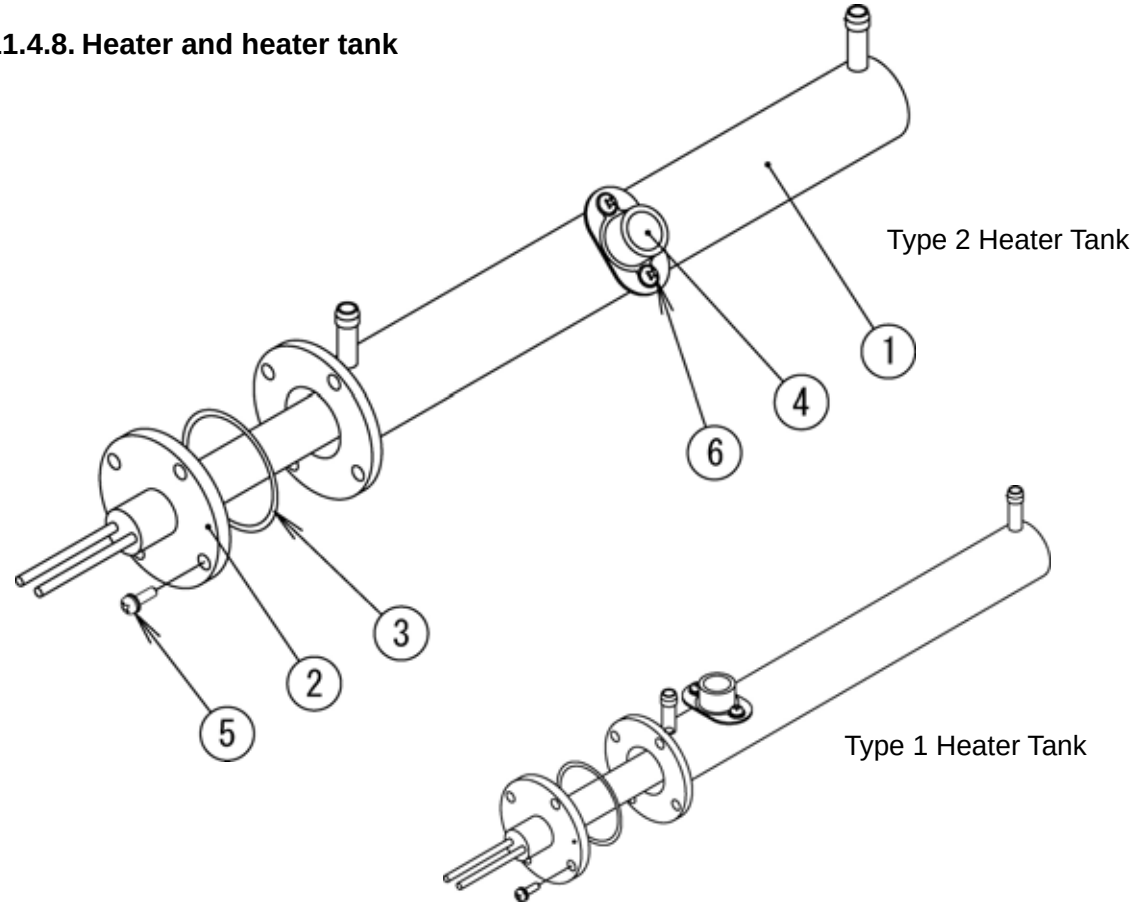
NOTE） Since the parts with hatched “No.” on the list above constitute as an assembly, each part cannot be purchased separately.

11.4.7. Conductivity sensor (CD 1 to 4)



No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Conductivity sensor Assy		0-401-	039	
1	Case A	PSU	0-401-	040	
2	O ring	AS568-104 silicone rubber	0-401-	041	
3	Electrode	Stainless Steel	0-401-	042	
4	Cross recessed head pan screw	Stainless Steel P3 M3×8	0-401-	043	

11.4.8. Heater and heater tank



NOTE

Type 2 Heater Tank is equipped the models with serial No.06C000*E / 06D000*E or later.

⚠CAUTION

Do not use Type1 Heater tank in the models with serial No.06C000*E / 06D000*E or later.

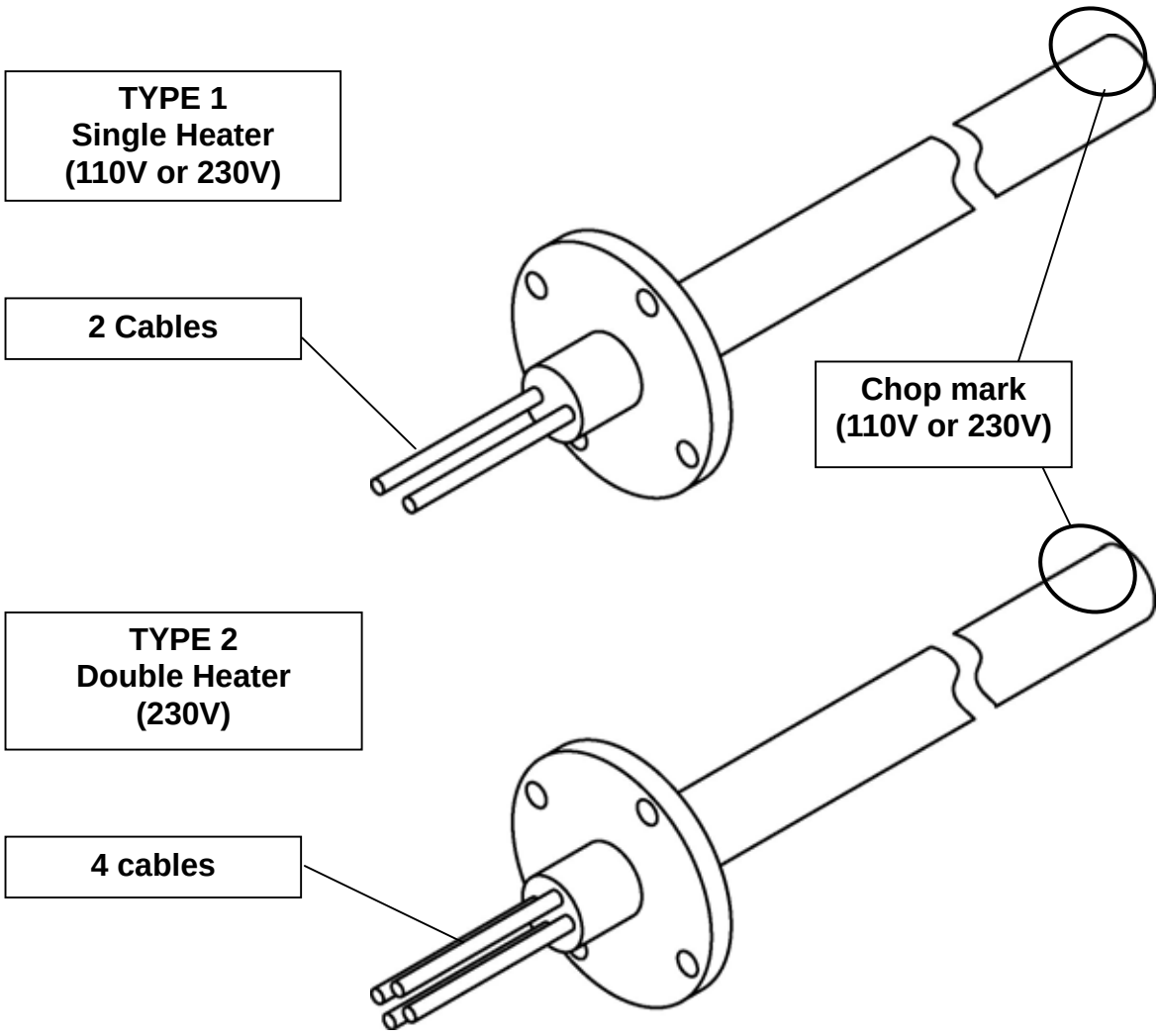
No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Heater Assy		0-401-	044	
1	Heater tank	Stainless Steel	0-401-		Compatible with Type 2
			0-401-	045	Type 2
2	Cartridge heater		0-401-	046	230V Type 1
			0-401-	201	230V Type 2
			0-401-	202	110V Type 1
3	O ring	JASO 1033	0-401-	047	
4	Thermostat	03PNA100	0-401-	048	
5	Cross recessed hex. head bolt	P3 M3×10 Stainless Steel	0-401-	028	
6	Cross recessed head pan screw	P3 M3×6 Stainless Steel	0-401-	049	

Serial No.	110V Model	230V Model
03A0001E - 04A0207E (TYPE 1)	Single Heater (Type 1)	Single Heater (Type 1)
04A0208E – 06A (or B) 0609E (or S) (TYPE 2)	Single Heater (Type 1)	Single Heater (Type 1)
06C (or D) 0001E or later (TYPE 3)	Single Heater (Type 1)	Double Heater (Type 2)

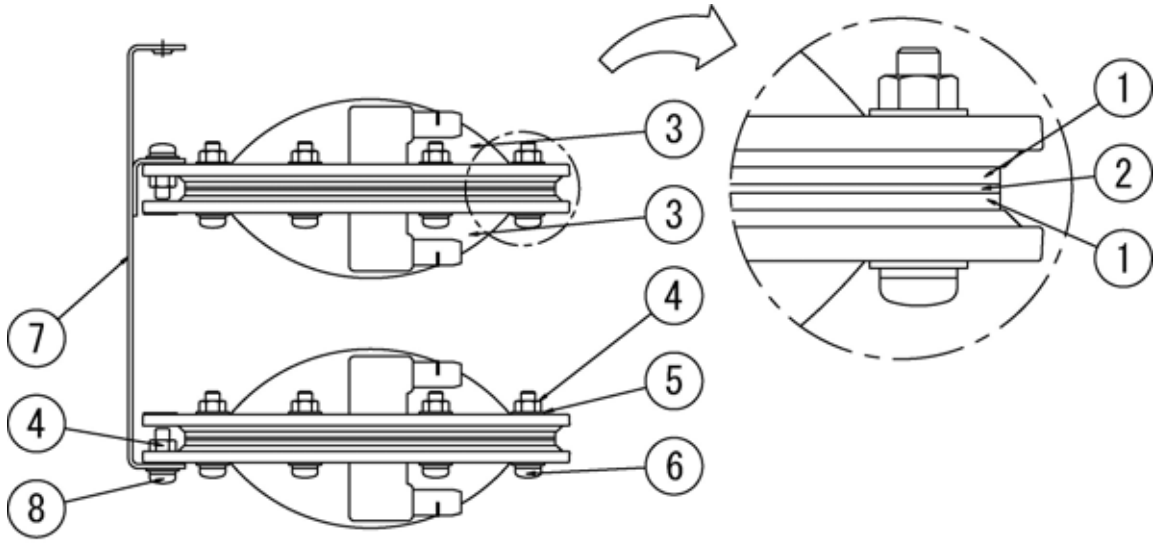
⚠DANGER

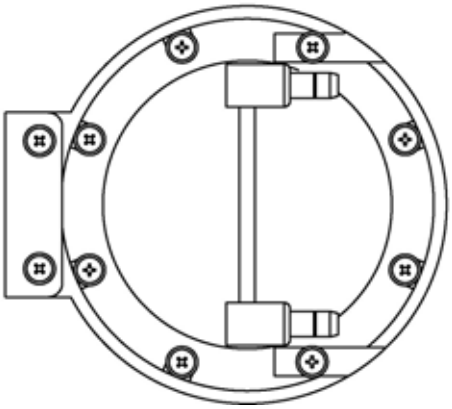
Installing different type heater causes a breakdown of machine. To replace heater, confirm specifications of heater and machine.

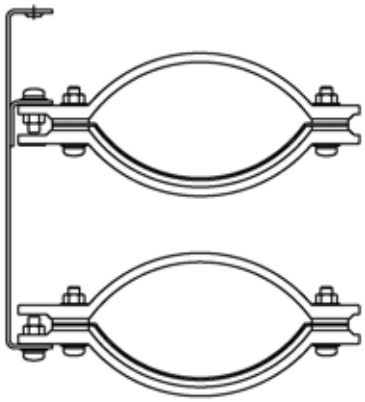
Reference: Difference of Heater Type



11.4.9. Chamber (CHa, CHb)



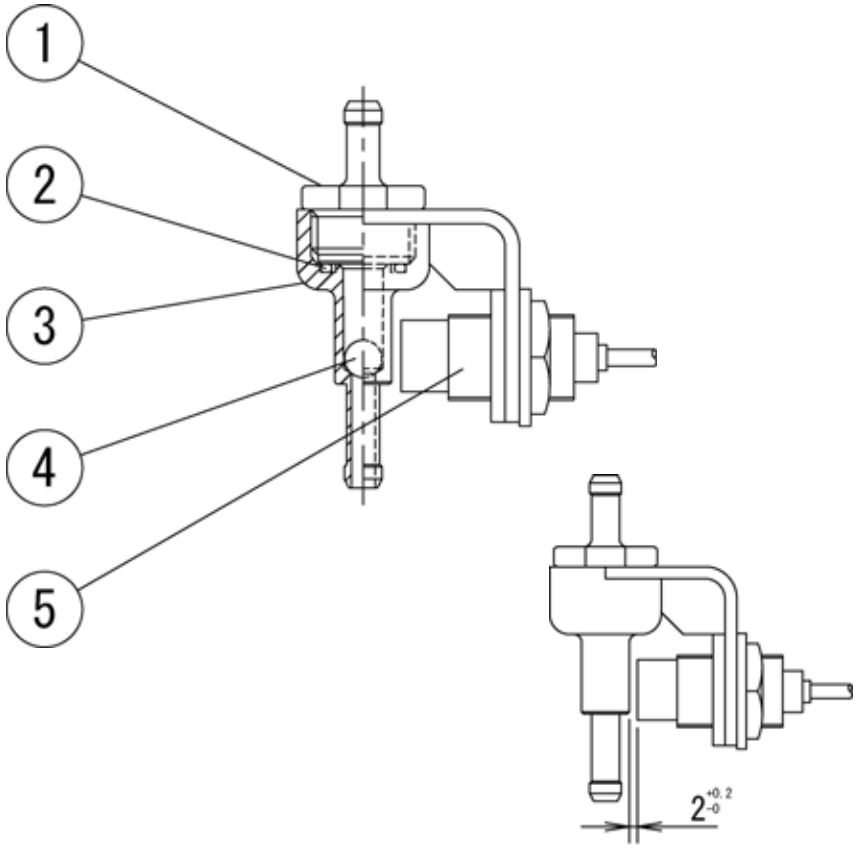




Assembling direction of diaphragm

No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Chamber Assy		0-401-	050	Above 1 set
	CHa / CHb Assy		0-401-	051	Only half side Assy
1	Chamber packing	FKM	0-401-	052	
2	Chamber diaphragm	FKM	0-401-	053	
3	Casing	PPS	0-401-	054	
4	Hex. nut	M5 Stainless Steel	0-401-	004	
5	Plain washer	M5 Stainless Steel	0-401-	055	
6	Cross recessed head pan screw	P3 M5×25	0-401-	056	
7	Chamber bracket	Stainless Steel	0-401-	057	
8	Cross recessed head pan screw	P3 M5×16	0-401-	058	

11.4.10. Flow switch



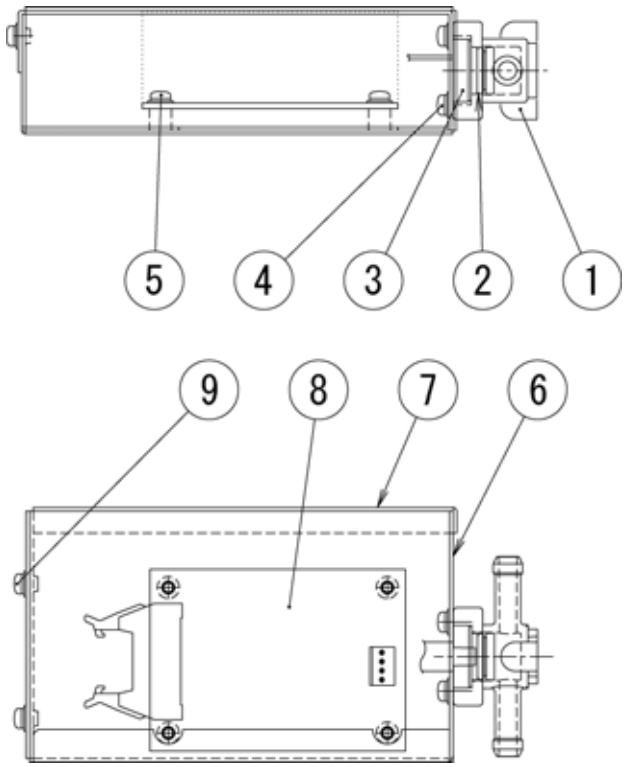
Dimension of Proximity sensor
Assembling (unit: mm)

No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Flow SW Assy		0-401-	059	
1	Flow SW cap	PSU	0-401-	060	
2	O ring	P14 silicone rubber	0-401-	061	
3	Body of flow SW	PSU	0-401-	062	
4	Steel ball	Stainless Steel 5/16	0-401-	063	
5	Proximity sensor	GX18-MLU	0-401-	064	

11.4.11. Dialysate pressure sensor (PG3)

11.4.11.1 Dialysate pressure sensor (Type 1)

NOTE） This type 1 is equipped the models with serial No. before or equal 06A0389, 06A391*-0402*, 422-425*, 458*. Other machines are equipped with Type2.



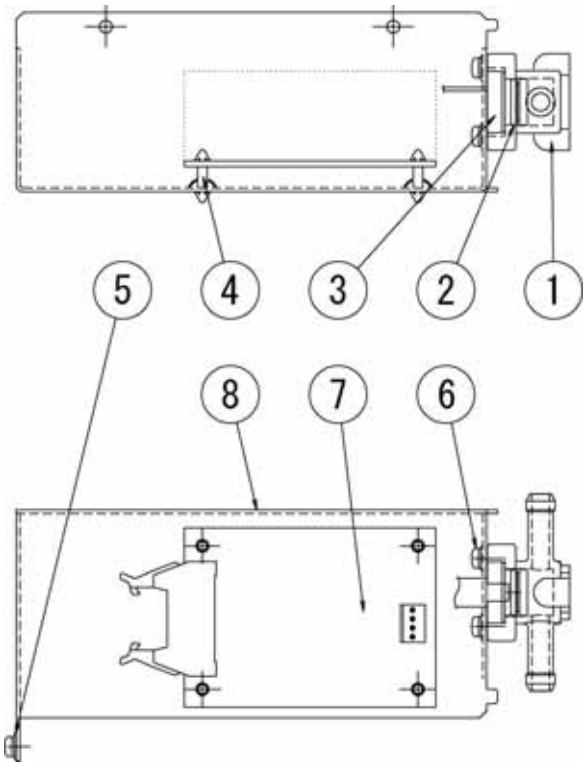
No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Dialysate pressure sensor Type 1 Assy		0-401-	065	
1	Pressure sensor holder	PSU	0-401-	066	
2	O ring	AS568-012 silicone rubber	0-401-	067	
3	Dialysate pressure sensor board	19C030PV3K	0-402-	001	3 and 8 constitute as an assembly.
4	Cross recessed head pan screw	P3 M3×10	0-401-	028	
5	Cross recessed head pan screw	P3 M3×6	0-401-	068	
6	Pressure sensor P.C. board cover	Stainless Steel	0-401-	069	
7	Pressure sensor P.C. board fixing plate	Stainless Steel	0-401-	070	
8	Dialysate pressure sensor board	BP03-01	0-402-	001	3 and 8 constitute as an assembly.
9	Cross recessed head pan screw	P3 M3×10	0-401-	028	

NOTE） Since the parts with hatched “No.” on the list above constitute as an assembly, each part cannot be purchased separately.

⚠CAUTION

To touch sensor diaphragm may cause of sensor trouble.
To replace parts, be careful not to touch diaphragm.

11.4.11.2 Dialysate pressure sensor (Type 2)



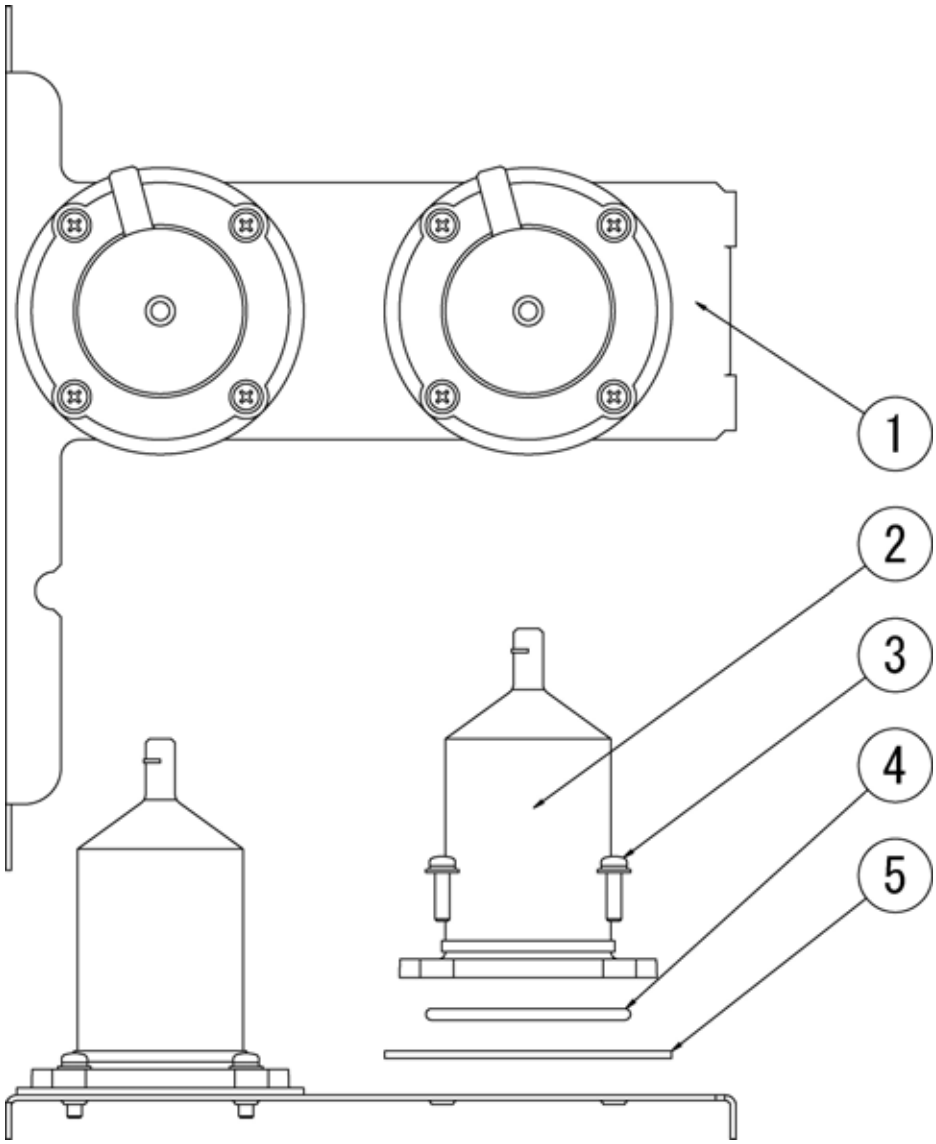
No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Dialysate pressure sensor type 2 Assy		0-401-	071	
1	Pressure sensor holder	PSU	0-401-	066	
2	O ring	AS568-012 silicone rubber	0-401-	067	
3	Dialysate pressure sensor board	19C030PV3K	0-402-	001	3 and 7 constitute as an assembly.
4	PCB spacer	Nylon 66	0-401-	072	
5	Cross recessed head pan screw	P3 M4×8	0-401-	073	
6	Cross recessed head pan screw	P3 M3×10	0-401-	028	
7	Dialysate pressure sensor board	BP03-01	0-402-	001	3 and 7 constitute as an assembly.
8	Dialysate pressure sensor PCB cover	Stainless Steel	0-401-	074	

NOTE） Since the parts with hatched “No.” on the list above constitute as an assembly, each part cannot be purchased separately.

⚠CAUTION

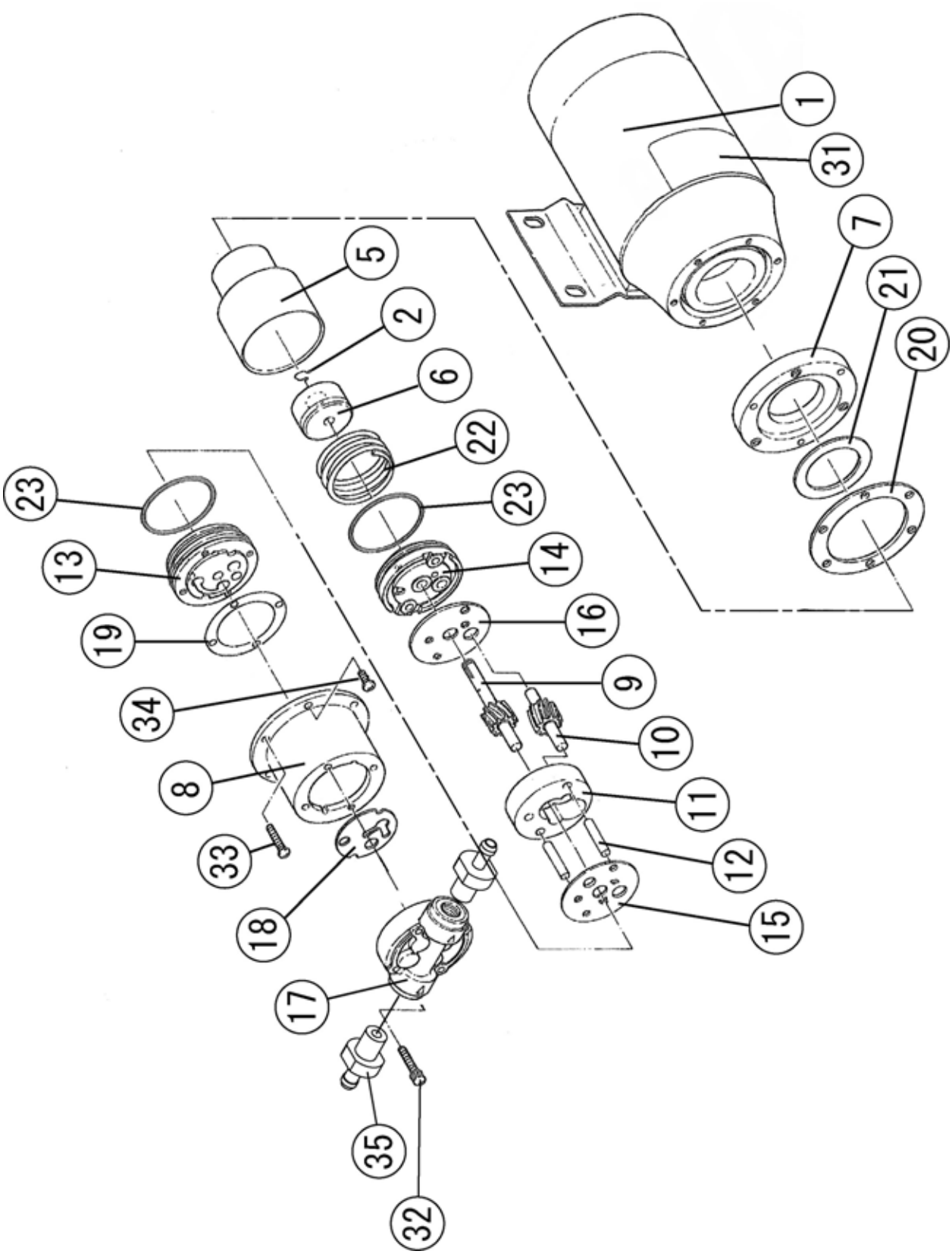
To touch sensor diaphragm may cause of sensor trouble.
To replace parts, be careful not to touch diaphragm.

11.4.12. Mixing tank



No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Mixing chamber Assy		0-401-	075	
1	Tank bracket	Stainless Steel	0-401-	076	
2	Lower tank	PSU	0-401-	016	
3	Cross recessed head pan screw	P3 M4×16	0-401-	017	
4	O ring	G50 silicone rubber	0-401-	014	
5	Tank lid	Stainless Steel	0-401-	026	

11.4.13. Gear pump (P1, P2)



No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Magnet Gear pump		0-401-	077	
	Gear set		0-401-	078	Set of No. 9, 10, 13 to 16, 18, 23
	Pump head Assy		0-401-	079	Without 1,31
1	Motor		0-401-	080	
2	Magnet retaining ring	Stainless Steel	0-401-	081	
5	Rear casing	Stainless steel	0-401-	082	
6	Magnet can	Stainless steel	0-401-	083	
7	Mounting plate	Stainless Steel	0-401-	084	
8	Bracket	Stainless Steel	0-401-	085	
9	Driven gear	PEEK		-	Including Gear set
10	Idler gear	PEEK		-	Including Gear set
11	Gear case	Stainless Steel	0-401-	086	
12	Straight pin	Stainless Steel	0-401-	087	
13	Front bearing	PPS		-	Including Gear set
14	Rear bearing	PPS		-	Including Gear set
15	Front plate	Stainless Steel		-	Including Gear set
16	Rear plate	Stainless Steel		-	Including Gear set
17	Pump head	GFRPPS	0-401-	088	
18	Gasket A	FKM	0-401-	089	
19	Gasket B	FKM	0-401-	090	
20	Packing B	EPDM	0-401-	091	
21	Packing C	EPDM	0-401-	092	
22	Retainer spring	Stainless Steel	0-401-	093	
23	O ring	FKM	0-401-	094	
31	Name plate	Polyester			
32	Cross recessed head machine screw	Stainless Steel P3 M3×20	0-401-	095	
33	Cross recessed head machine screw	Stainless Steel M3×16	0-401-	096	
34	Cross recessed head machine screw	Stainless Steel M3×8	0-401-	097	
35	Joint	PSU	0-401-	098	

※) Since the parts with hatched “No.” on the list above constitute as an assembly, each part cannot be purchased separately.

Reference: Disassembling and exchanging gear pump and pump-head parts

⚠CAUTION

The gear pump is a precision part. Take special caution not to contaminate with dust or other contaminant when assembling. In addition, some parts are in similar forms. Avoid confusing these parts when assembling.

Disassembling procedure

1. Remove 3 cross-recessed head machine screws (33) and take out the pump part from the motor.

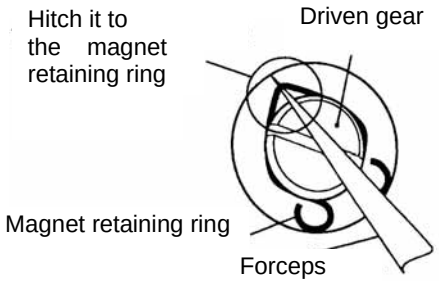
2. Remove 4 cross-recessed head machine screws (32) to remove the pump head.

3. Remove the gasket A (18).

4. Remove the cross-recessed head machine screw (34). Remove the mounting plate (7), packing B (20), bracket (8), and gasket B (19) from the pump part.

5. Remove the rear casing (5) while keeping the packing C (21) on the rear casing. (Take precautions, because fluid may still be inside the rear casing.)
   When removing the rear casing (5), do so while turning the front bearing (13) and rear casing (5). If the rear bearing (14) remains inside the rear casing (5), hold the shaft of the driven gear (9) and carefully pull it out.

6. Remove the magnet retaining ring (2) and the retainer spring (22).



⚠CAUTION

Remove the magnet retaining ring gradually and carefully. The magnet retaining ring might distort if it is pulled forcibly.

7. Remove the magnet can (6) from the driven gear (9). Store the removed magnet can in a place where no iron filings, etc. would be in contact.

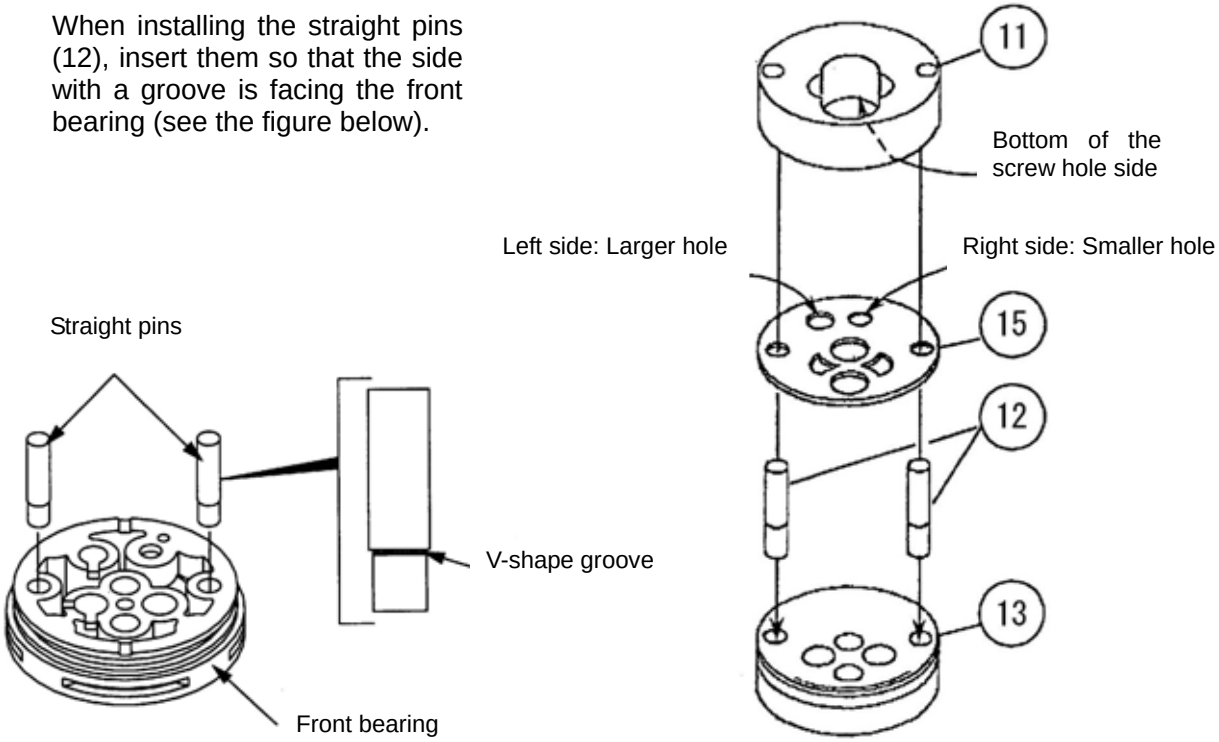
8. Disassemble in the order of rear bearing (14), rear plate (16), driven gear (9), idler gear (10), gear case (11), 2 straight pins (12), front plate (15), and front bearing (13). Handle parts carefully so that they will not be damaged. Store them where no dust, etc. would fall on.

Assembly procedure

1. Install the O ring (23) to the front bearing (13) and rear bearing (14). Be sure to apply a thin layer of silicon grease on the O ring to prevent a leak.

2. Install the straight pins (12), front plate (15), and gear case (11) on the front bearing (13).

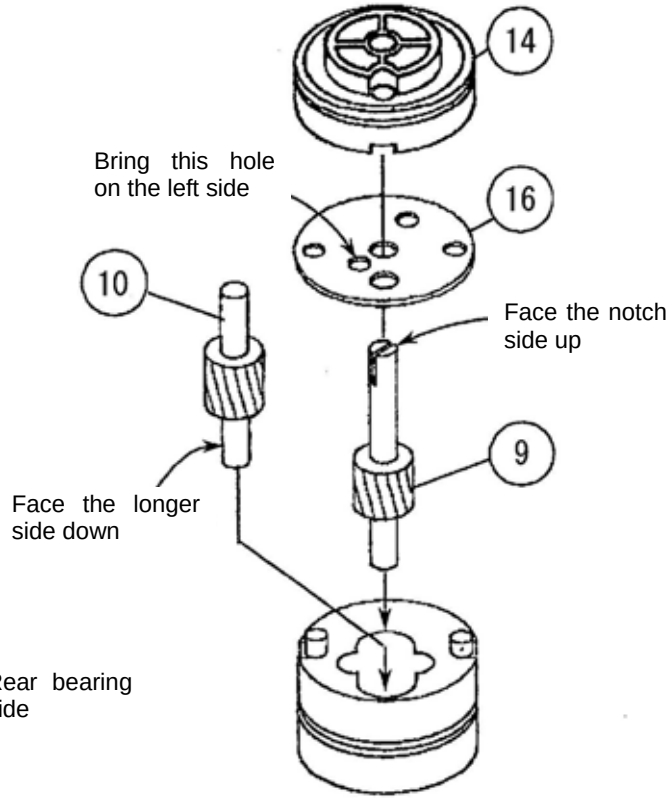
When installing the straight pins (12), insert them so that the side with a groove is facing the front bearing (see the figure below).

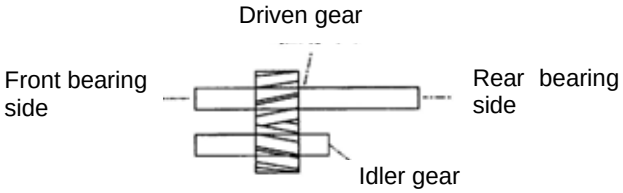


⚠CAUTION

Inserting the straight pins inversely would lower the dialysate suction force, and this can result in discharge failure and damage in the pump part. Make sure the direction of straight pins, when inserting.

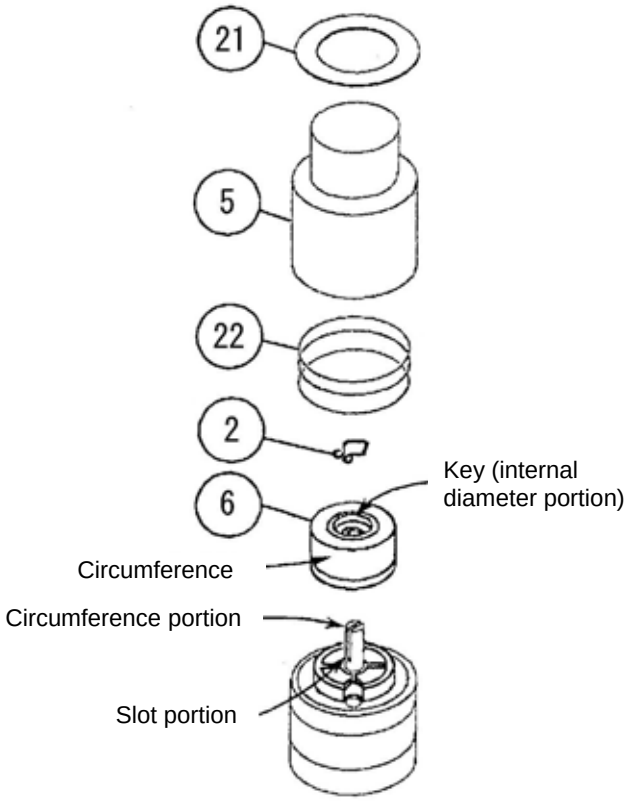
3. Assemble carefully in the order of driven gear (9), idler gear (10), rear plate (16), and rear bearing (14), so that holes in the parts align. Be sure to insert the driven gear (9) and idler gear (10) in the direction shown in the figure below.



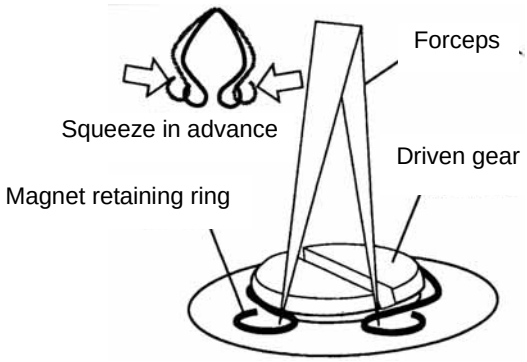


4. Insert the magnet can (6) into the driven gear (9) and fix them with the magnet retaining ring (2).
Insert the retainer spring (22), rear casing (5), and packing C (21).

When installing the magnet can, check if no dust is present around the circumference in advance. Assemble after aligning the key and screw slotting.



When installing the magnet retaining ring, do so after squeezing it first, as shown in the figure on the right.

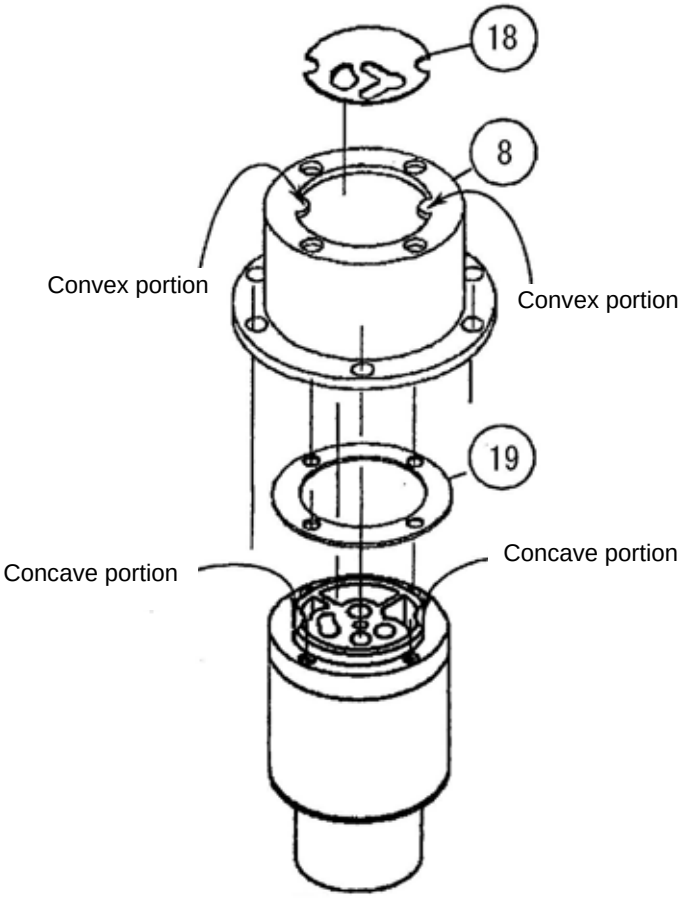


⚠CAUTION

Loose magnet retaining ring might come off. Be sure to squeeze before insertion. (※Insert the magnet retaining ring firmly onto the groove of the projecting driven gear)

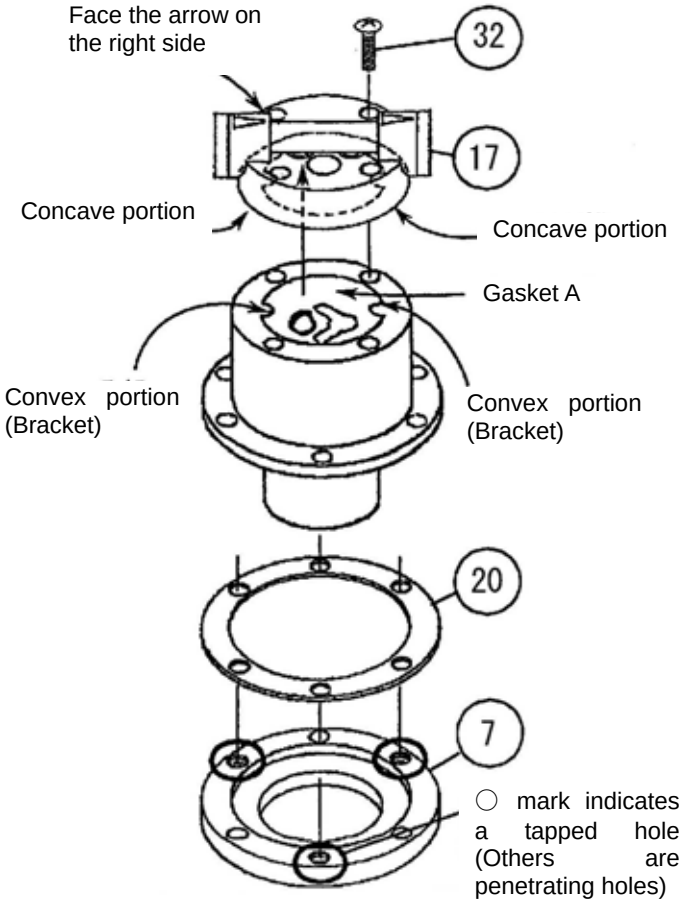
Do not turn the rear casing itself. Assemble the rear casing by pushing in vertically, until the O ring of the front bearing is fully covered.

5. Install the gasket B (19), bracket (8), and gasket A (18) on the front bearing (13). Align the 2 concave and convex portions of the parts.



6. Tack the pump head (17) with 4 cross-recessed head machine screws (32). Fix the packing B (20) and mounting plate (7) with 4 cross-recessed head machine screws (34).

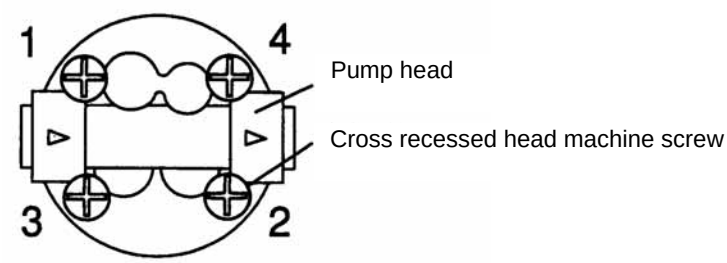
   Use 0.6Nm fixing torque for the cross recessed head machine screws(34) to tighten.



7. Fix the pump head (17) that has been tacked.

   Use 0.8Nm fixing torque for the cross recessed head machine screws(32) to tighten.
   Tighten gradually and evenly in the diagonal order shown below. In the end, bring it to the regulation torque.

The order of fixing screws



⚠CAUTION

When the pump head is installed with higher torque than regulation or only one side is being tightened, the screw part of the front bearing may be damaged.

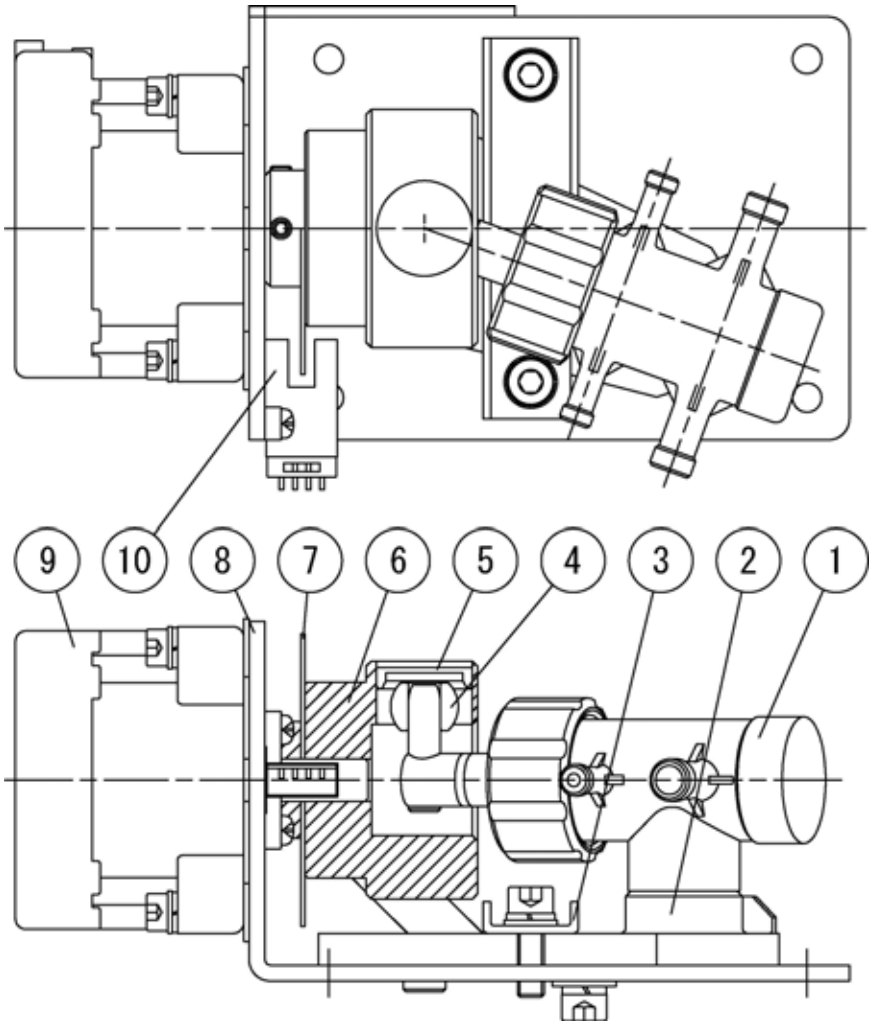
8. Install the assembled pump head part to the motor using 3 cross recessed heard machine screws (33).

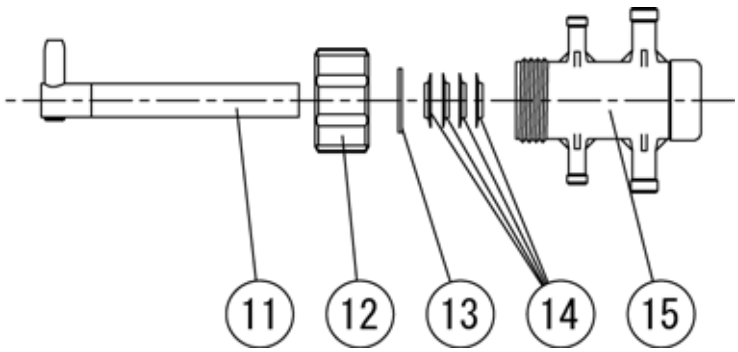
   Use 0.6 Nm fixing torque for the cross recessed head machine screws (34).

11.4.14. Piston pump

11.4.14.1 UF pump (P3) (Type1)

NOTE）This type of UF pump is equipped the models with serial No.03A00001E to No.04A0207E.





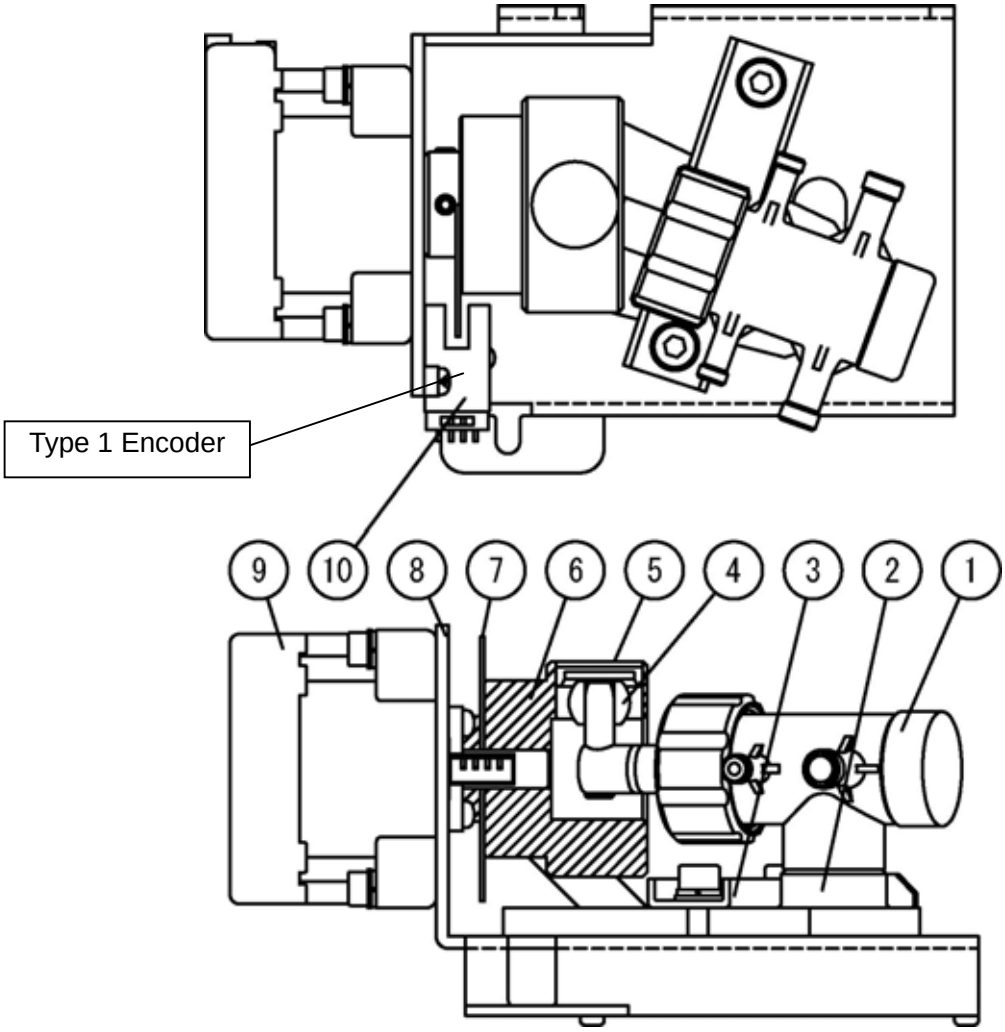
Pump head ASSY

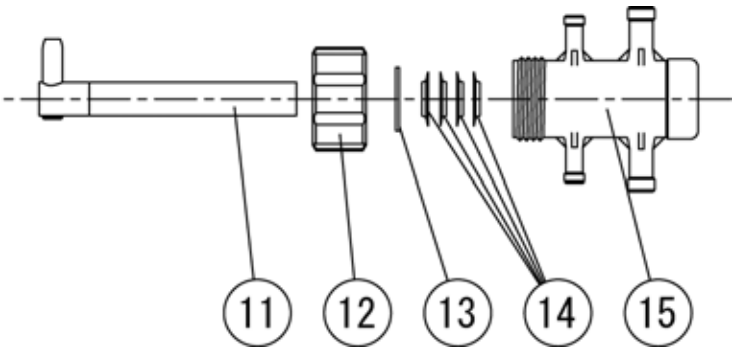
No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	UF pump Assy				Compatible with Type2 (0-401-099)
	Drive joint Assy		0-401-	100	Set of No. 4 to 7
1	Pump head Assy		0-401-	101	Set of No. 11 to 15
2	Pump rack	SCS13 or ADC12	0-401-	102	
3	Fixing plate with bracket	SUS304.	0-401-	103	
4	Sphered ball bearing	Rod end HB6		-	
5	Sphered ball bearing cap	POM		-	
6	Drive joint	Aluminum		-	
7	Rotation detection board	Aluminum		-	
8	Pump frame	Stainless Steel			Compatible with Type2 (0-401-109)
9	Stepping motor	KT56JM4-009	0-401-	104	
10	Photo sensor	EE-SX672A	0-401-	105	
11	Plunger			-	
12	Hex cap nut		0-401-	106	
13	Back seat		0-401-	107	
14	Lip seal		0-401-	108	
15	Cylinder			-	

NOTE） Since the parts with hatched “No.” on the list above constitute as an assembly, each part cannot be purchased separately.

11.4.14.2 UF pump (P3) (Type2)

NOTE）This type of UF pump is equipped the models with serial No.04A0208E or later.

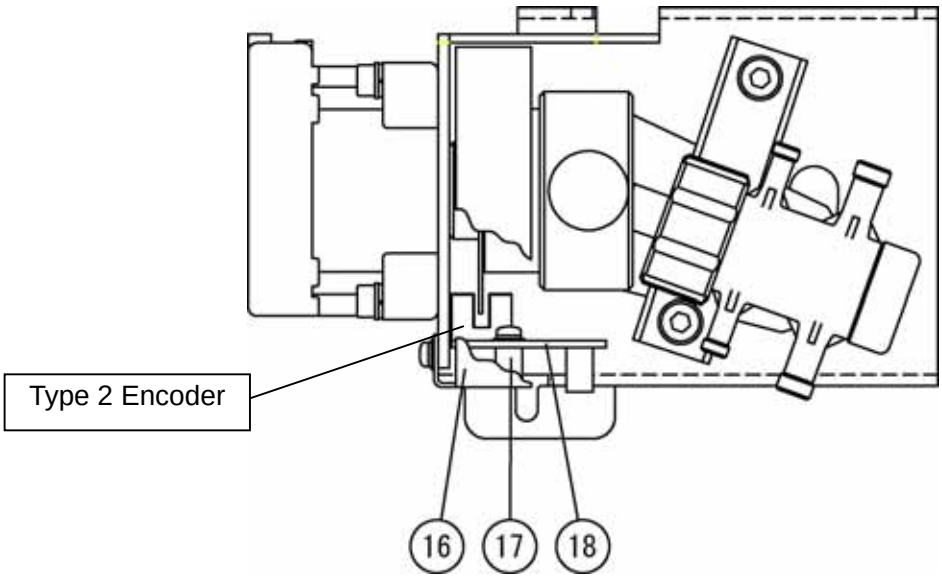




Pump head ASSY

NOTE

The models with serial Number 06C (or D) 000*E or later equip Type 2 Encoder to monitor rotation and direction of stepping motor. (Type 1 Encoder monitors rotation only.)

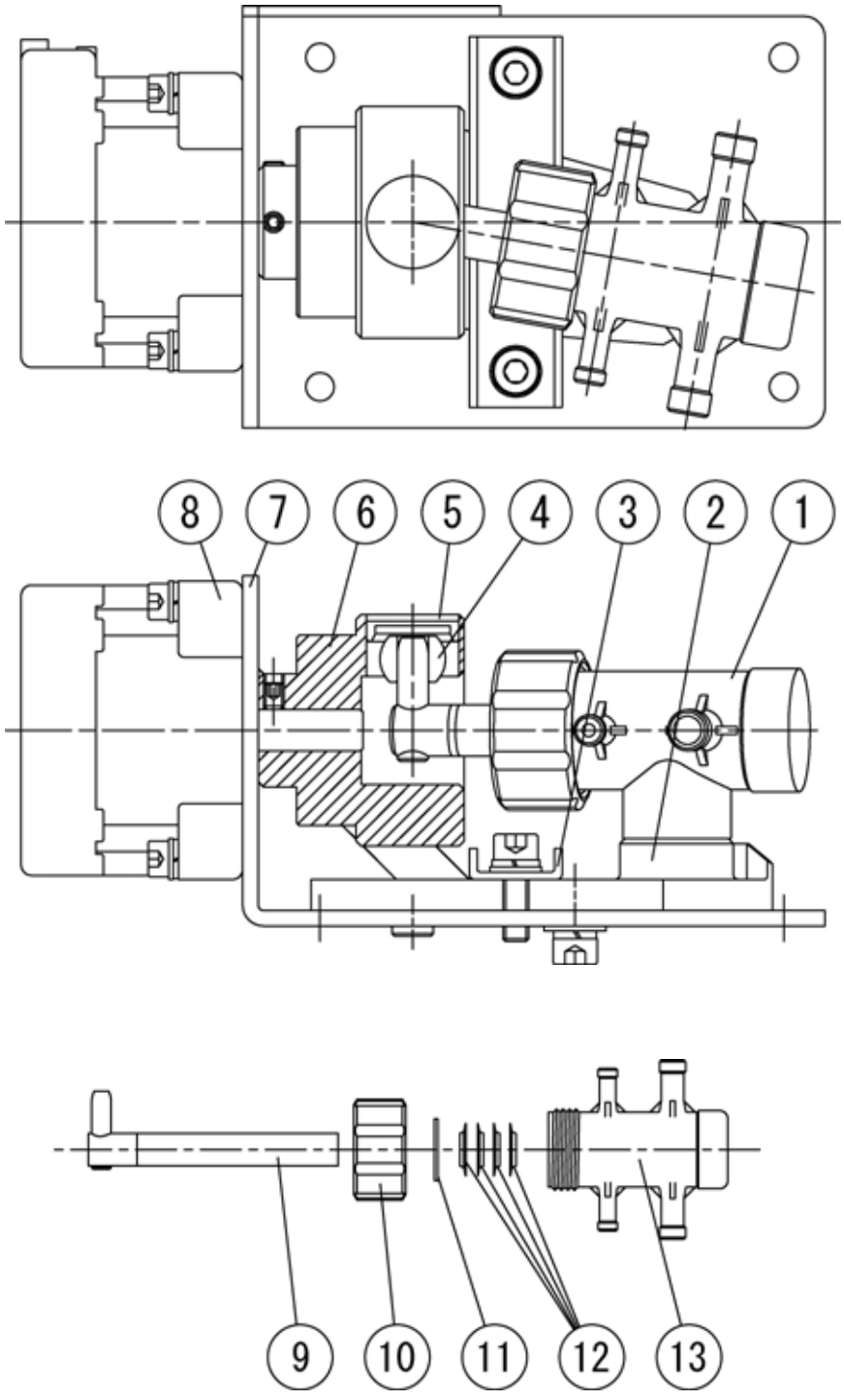


No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	UF pump Assy		0-401-	099	Compatible with Type 1(0-401-099)
	Drive joint Assy		0-401-	100	Set of No. 4 to 7
1	Pump head Assy		0-401-	101	Set of No. 11 to 15
2	Pump rack	SCS13 or ADC12	0-401-	102	
3	Fixing plate with bracket	Stainless Steel	0-401-	103	
4	Sphered ball bearing	Rod end HB6		-	
5	Sphered ball bearing cap	POM		-	
6	Drive joint	Aluminum		-	
7	Rotation detection board	Aluminum		-	
8	Pump frame	Stainless Steel	0-401-	109	
9	Stepping motor	KT56JM4-009	0-401-	104	
10	Photo sensor	EE-SX672A	0-401-	105	Type 1
11	Plunger			-	
12	Hex cap nut		0-401-	106	
13	Back seat		0-401-	107	
14	Lip seal		0-401-	108	
15	Cylinder			-	
16	Cover	Stainless Steel	0-401-	203	
17	Spacer	EP-8	0-401-	204	
18	UFP Encoder BP	BP05-34	0-402-	084	Type 2

NOTE） Since the parts with hatched “No.” on the list above constitute as an assembly, each part cannot be purchased separately.

11.4.14.3 Concentration pump (For B liquid; P4) (Type1)

NOTE） This type of Concentration pump is equipped the models with equal or before serial No.04A0207E.



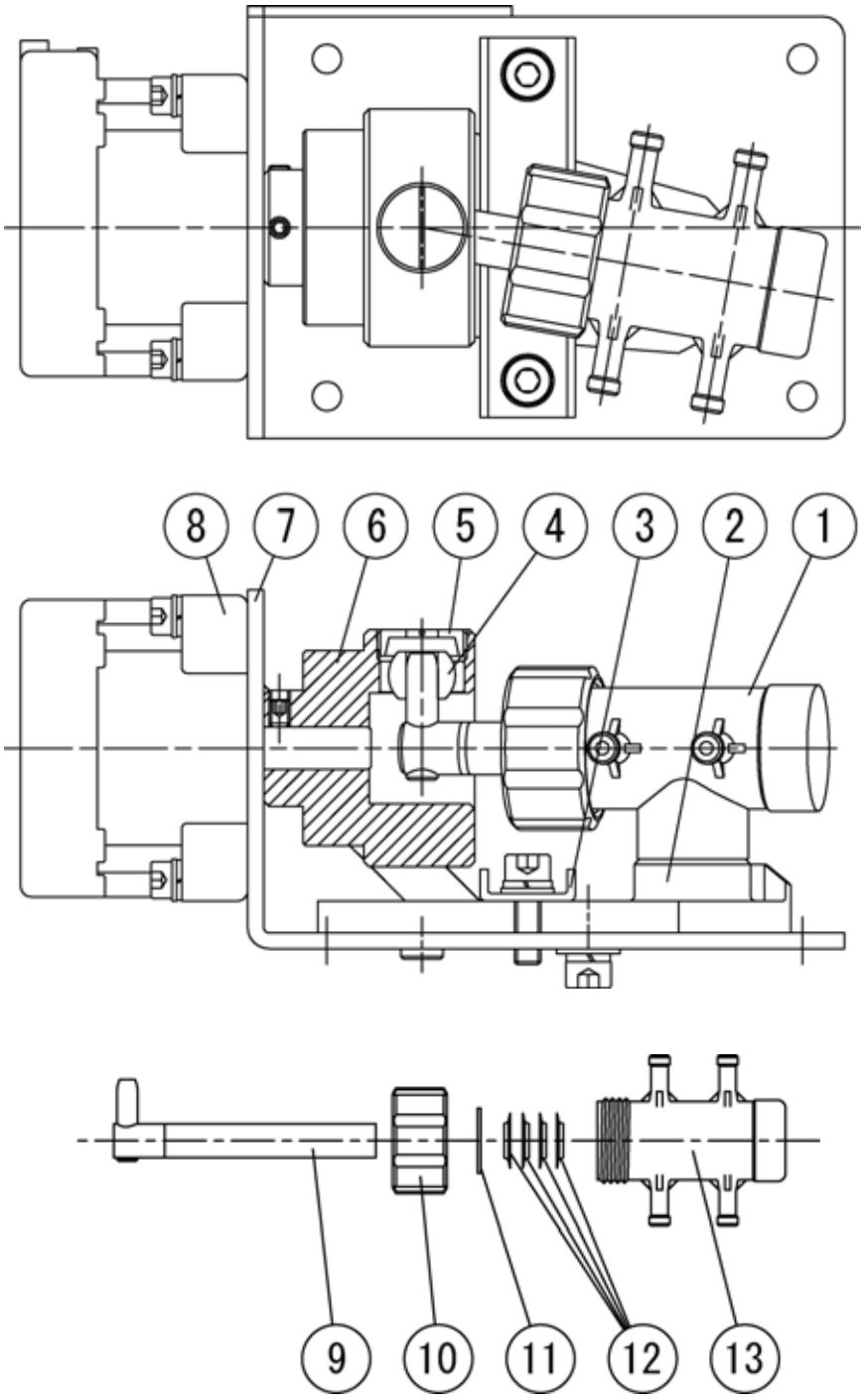
Pump head ASSY

No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	P4 type 1 Assy				Compatible with 0-401-110(See Note1)
	Drive joint Assy		0-401-	100	Set of No. 4 to 6
1	Pump head Assy		0-401-	101	Set of No. 9 to 13
2	Pump rack	SCS13 or ADC12	0-401-	102	
3	Fixing plate with bracket	Stainless Steel	0-401-	103	
4	Sphered ball bearing	Rod end HB6		-	
5	Sphered ball bearing cap	POM		-	
6	Drive joint	Aluminum		-	
7	Pump frame	Stainless Steel			Compatible with Type2 (0-401-110)
8	Stepping motor	KT56JM4-009	0-401-	104	
9	Plunger		0-401-	-	
10	Hex cap nut		0-401-	106	
11	Back seat		0-401-	107	
12	Lip seal		0-401-	108	
13	Cylinder			-	

NOTE） Since the parts with hatched “No.” on the list above as assembly, each part cannot be purchased separately.

11.4.14.4 Concentration pump (For A liquid; P5) (Type1)

NOTE） This type of Concentration pump is equipped the models with serial No.03A00001E to No.04A0207E.



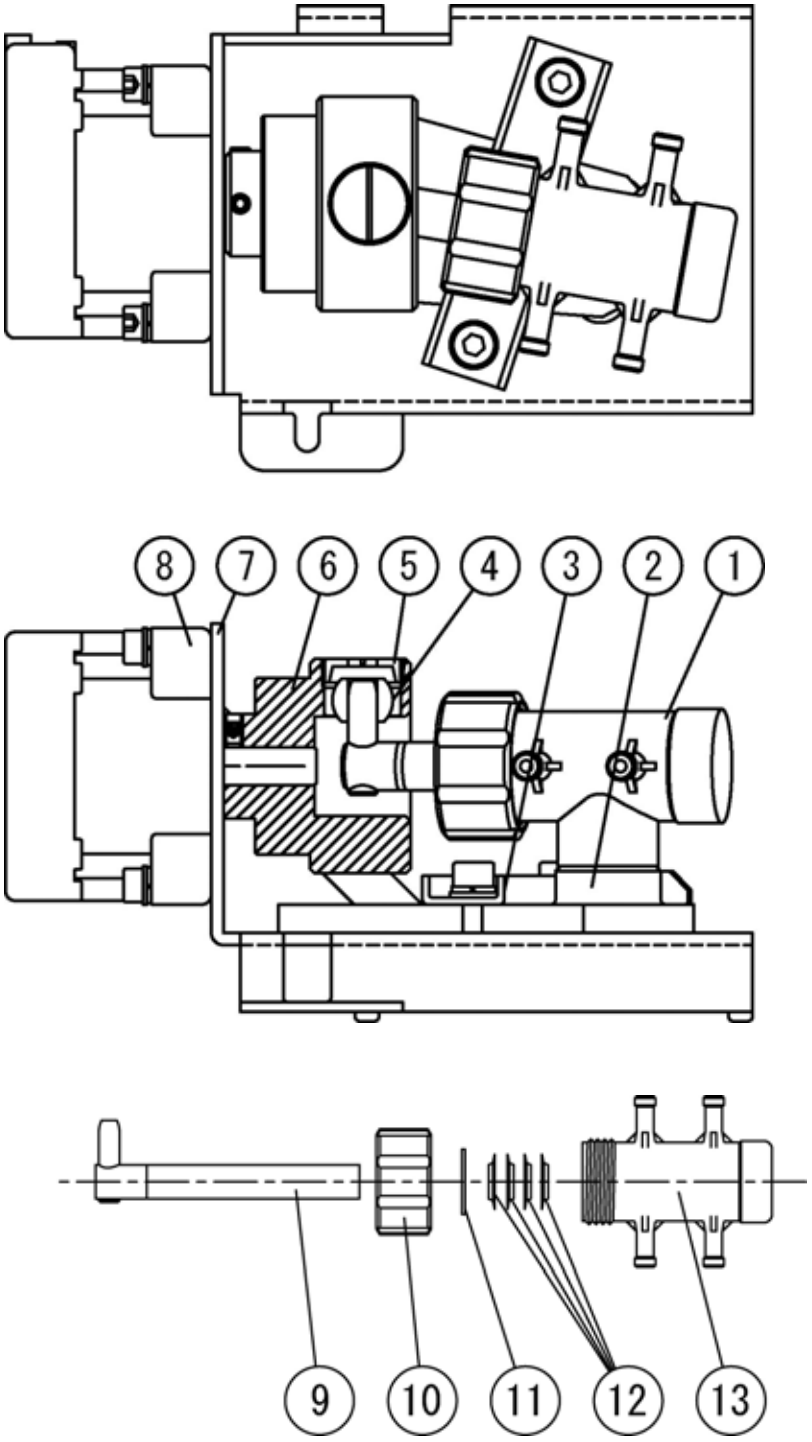
Pump head ASSY

No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	P5 type 1 pump				Compatible with Type2 (0-401-110)
	Drive joint Assy		0-401-	111	Set of No. 4 to 6
1	Pump head Assy		0-401-	112	Set of No. 9 to 13
2	Pump rack	SCS13 or ADC12	0-401-	102	
3	Fixing plate with bracket	Stainless Steel	0-401-	103	
4	Sphered ball bearing	Rod end HB6		-	
5	Sphered ball bearing cap	POM		-	
6	Drive joint	Aluminum		-	
7	Pump frame	Stainless Steel			Compatible with Type2
8	Stepping motor	KT56JM4-009	0-401-	104	
9	Plunger			-	
10	Hex cap nut		0-401-	106	
11	Back seat		0-401-	107	
12	Lip seal		0-401-	108	
13	Cylinder			-	

NOTE） Since the parts with hatched “No.” on the list above constitute as an assembly, each part cannot be purchased separately

11.4.14.5 Concentration pump (For A/B liquid) (Type2)

NOTE）This type of UF pump is equipped the models with serial No.04A0208E or later.



Pump head ASSY

No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Concentration pump		0-401-	110	Compatible with Type1
	Drive joint Assy		0-401-	111	Set of No. 4 to 6
1	Pump head Assy		0-401-	112	Set of No. 9 to 13
2	Pump rack	SCS13 or ADC12	0-401-	102	
3	Fixing plate with bracket	Stainless Steel	0-401-	103	
4	Sphered ball bearing	Rod end HB6		-	
5	Sphered ball bearing cap	POM		-	
6	Drive joint	Aluminum		-	
7	Pump frame	Stainless Steel			Compatible with Type1
8	Stepping motor	KT56JM4-009	0-401-	104	
9	Plunger			-	
10	Hex cap nut		0-401-	106	
11	Back seat		0-401-	107	
12	Lip seal		0-401-	108	
13	Cylinder			-	

NOTE） Since the parts with hatched “No.” on the list above constitute as an assembly, each part cannot be purchased separately

Reference 1: UF pump & concentrate pumps - Method to replace lip seal

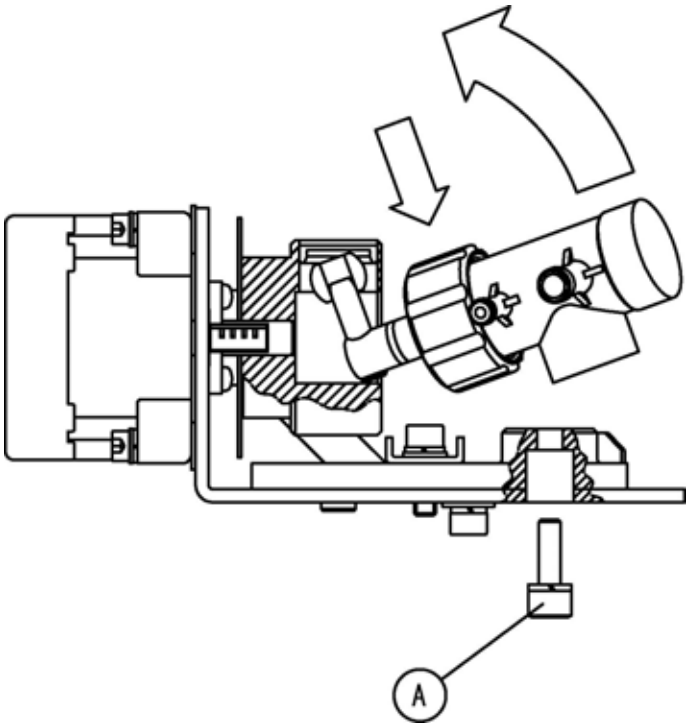
⚠CAUTION

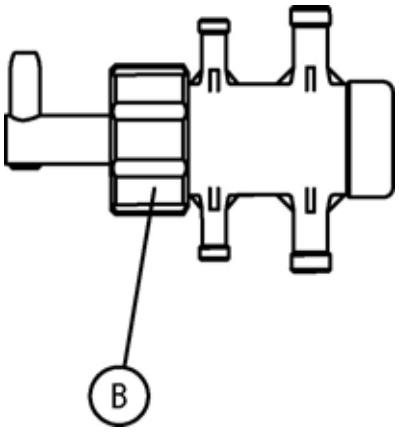
Each head parts of the UF pump and the A/B concentrate pumps are not compatible. If assembled incorrectly, it may cause a failure of the pump. Therefore, take special caution not to mix the parts of each pump when disassembling these pumps.

1. Unscrew Part A (M6 cap screw) shown in the right figure from the bottom of the pump (metering pump) with an Allen wrench (5 mm).

2. Pull out the shaft engaged in the sphered ball bearing, moving the head in the arrow direction in the right figure. Pump head is removed.

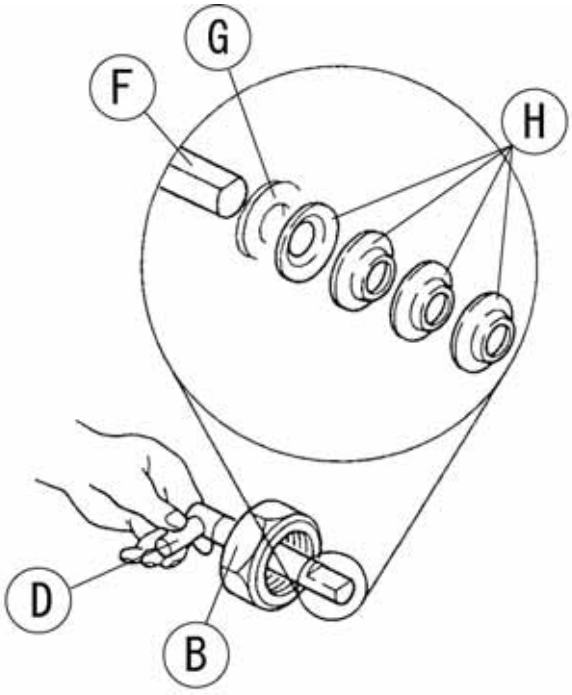
Take caution not to wipe off the grease attached to the sphered bearing section.





3. Rotate Part B (hex. cap nut) shown in the left figure to CCW carefully until it loosen.

4. Pull out Part F (plunger) carefully with D in the right figure.
5. Remove Parts H (lip seal) and G (back seat).
6. Insert the new parts G and H through part F in the order shown in the right figure. Take caution that Parts H are correctly oriented. When inserting Parts H, carefully insert them with special care.
7. After Parts H are assembled, wipe foreign matter or oil out from surface.
8. Assemble the parts according to the procedures opposite to the disassembly. The tightening torque of Part B should be 3.0 Nm.



9. Perform the hot rinse process at 85°C after installing the pump to the machine and connecting the tubes and harness correctly.
10. Confirm that there is no leak from pump head and tubes in the hot rinse process at 85°C. Tighten Part B (Hex. cap nut) until the leak stops if some leak was observed from pump head.

⚠WARNING

The temperature of each part rises up to around 80°C in the hot rinse process. Take sufficient caution and appropriate protection not to get burnt by when retightening Part B (Hex. cap nut).

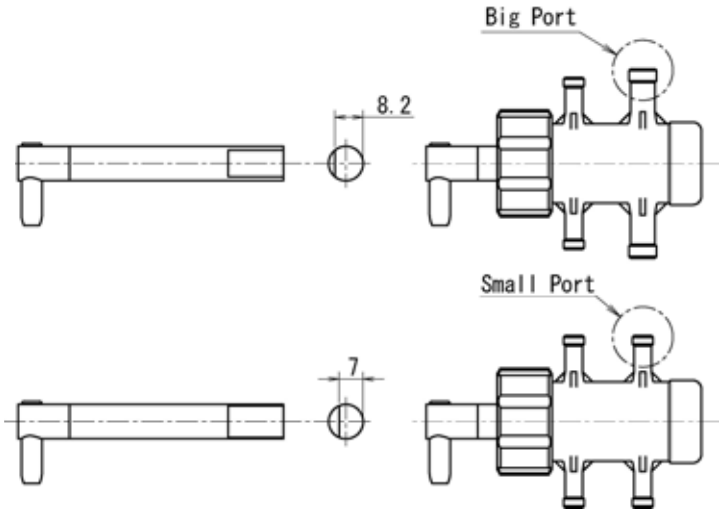
⚠WARNING

There is a possibility that water leaks from the pump head when the hot rinse process is executed after Part B (Hex. cap nut) is reassembled. Once Part B (Hex. cap nut) is removed for some reason such as replacement of the lip seal, etc., be sure to execute the hot rinse process and no water leak was observed under high temp condition.

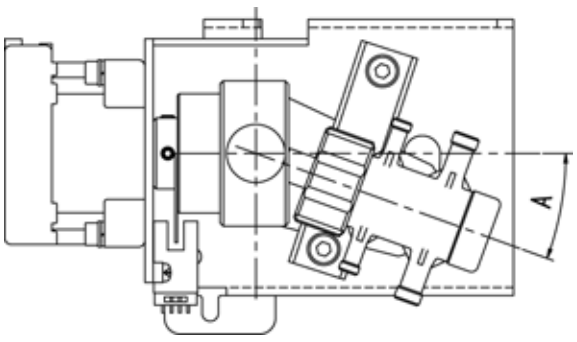
Reference 2： How different between each Piston pumps.

UF pump and Concentration pump looks similar but there are no compatible. Please pay attention to those parts are not compatible as well. Different between those pumps are described as below table.

	Type	Serial No. of machine	Piston head Assy type	Degree of head A°（and 1shot volume）	Bracket
UF Pump (P3)	1	Equal or before 04A0207E	Big port (Normal tube size 5 x 11mm) (High quality ceramic)	20°（approx. 0.7 mL）	Separate type
	2	After or equal 04A0208E			Integrated type
B conc. Pump (P4)	1	Equal or before 04A0207E		10°（approx 0.35 mL）	Separate type
	2	After or equal 04A0208E	Small port2 (Small tube size 2.5 x 5 mm) (Normal quality ceramic)		Integrate type
A conc. Pump (P5)	1	Equal or before 04A0207E			Separate type
	2	After or equal 04A0208E			Integrate type



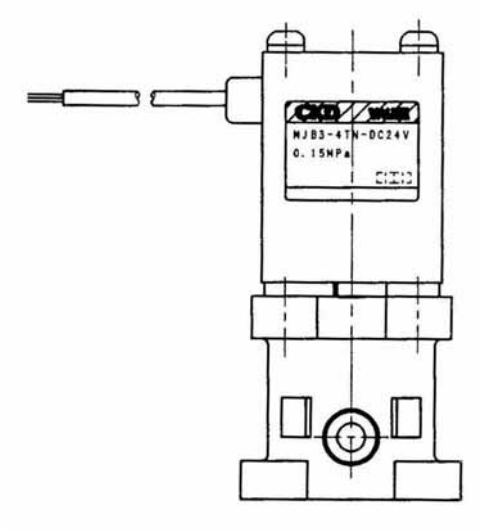
Piston haed Assy type



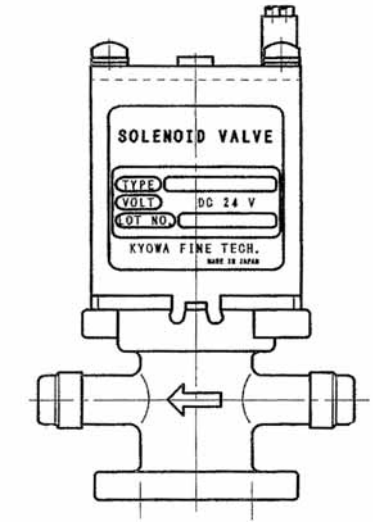
Degree of head

11.4.15. Two-way solenoid valve

NOTE）This type of valves is equipped the models with serial No. before or equal 06A0389, 06A0391*-0402*, 422-425*, 458*. Other machines are equipped with Type2 valve.



Type 1



Type 2

No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	2 way valve MJB3	MJB3			Compatible with Type2 (0-401-114)
	2 way valve KF2-3421A	KF2-3421A	0-401-	114	Compatible with Type 1

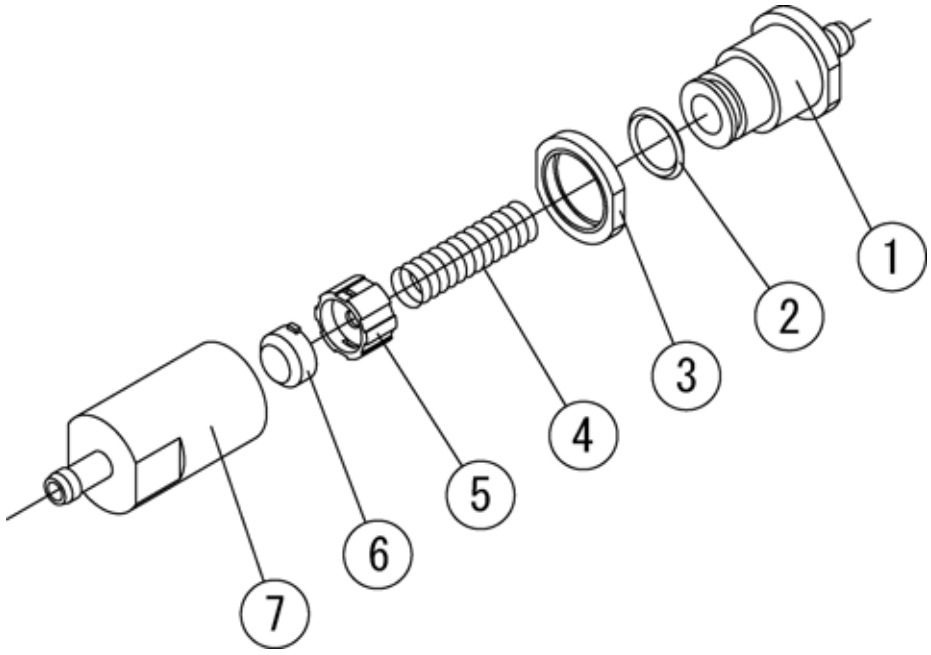
NOTE）Type 1 two-way valve production is stopped. Please use type 2 valve.
But regarding of compatibility from type 1 to Type 2, replacing V11, V22, V24, V51 and V52 with Type1 to Type 2 required special bracket.

NOTE

Two-way solenoid valve specifies flow direction and shown on the valve body. Confirm the direction when replacing these valves.

11.4.16. Check valve

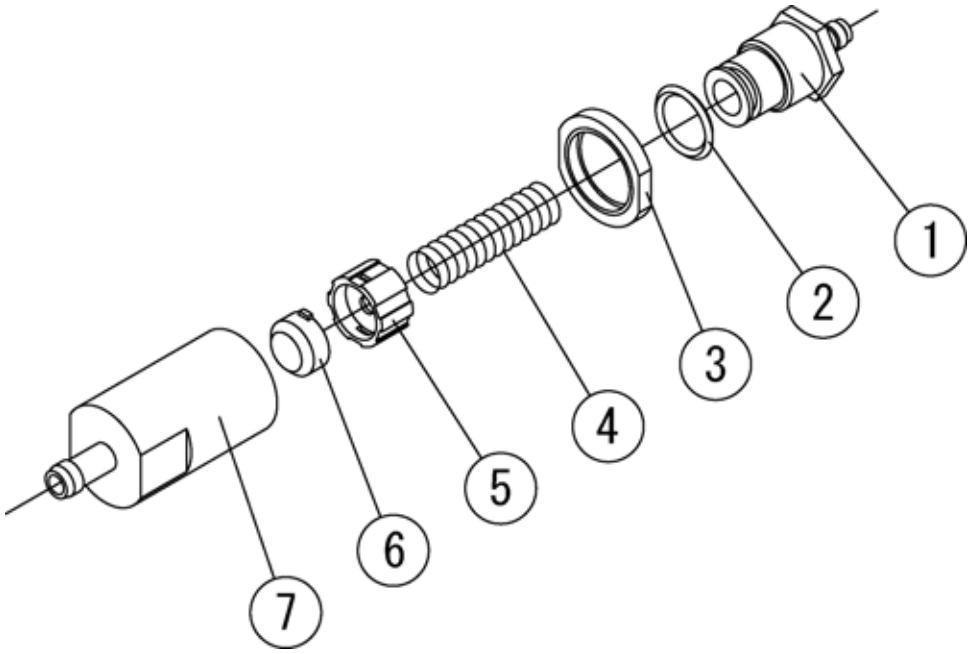
11.4.16.1 Check valve (Type1)



No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Check valve				Compatible with Type 2 (0-401-115)
1	Casing B	PPS			
2	O ring	P14 silicone rubber	0-401-	061	
3	Nut	PPS	0-401-	117	
4	Compression spring	Stainless Steel	0-401-	118	
5	Rubber stopper		0-401-	119	
6	Rubber stopper		0-401-	119	
7	Casing A	PPS	0-401-	120	

NOTE） Since the parts with hatched “No.” on the list above constitute as an assembly, each part cannot be purchased separately.
NOTE） This Type 1 check valve production is stopped. Please use type 2 check valve.

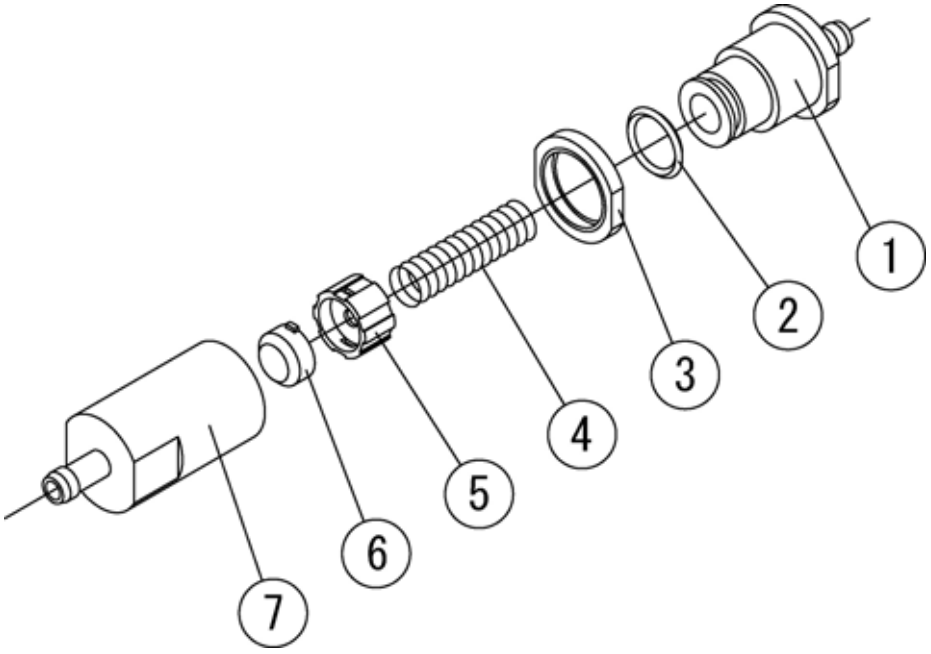
11.4.16.2 Check valve (Type2)



No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Check valve		0-401-	115	Compatible with Type 1
1	Cashing B	PPS	0-401-	116	
2	O ring	P14 silicone rubber	0-401-	061	
3	Nut	PPS	0-401-	117	
4	Compression spring	Stainless Steel	0-401-	218	
5	Rubber stopper		0-401-	119	
6	Rubber stopper		0-401-	119	
7	Casing A	PPS	0-401-	120	

NOTE） Since the parts with hatched “No.” on the list above constitute as an assembly, each part cannot be purchased separately.

11.4.16.3 Relief valve (RV1) (Type1)

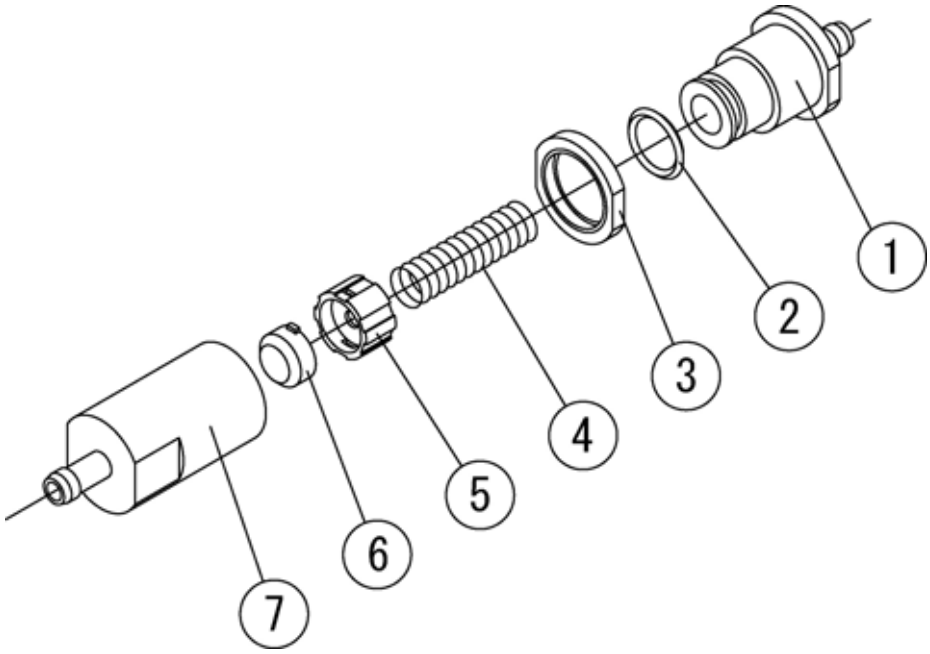


No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Relief valve				Compatible with 0-401-121
1	Casing B	PPS			
2	O ring	P14 silicone rubber	0-401-	061	
3	Nut	PPS	0-401-	117	
4	Compression spring	Stainless Steel	0-401-	122	
5	Rubber stopper		0-401-	119	
6	Rubber stopper		0-401-	119	
7	Casing A	PPS	0-401-	120	

NOTE）Since the parts with hatched “No.” on the list above constitute as an assembly, each part cannot be purchased separately.
NOTE）This Type 1 Relief valve production is stopped. Please use type 2 Relief valve.

11.4.16.4 Relief valve (RV2 /3) (Type1)

NOTE）RV3 is NOT equipped the models with serial No.04A0208E or later.



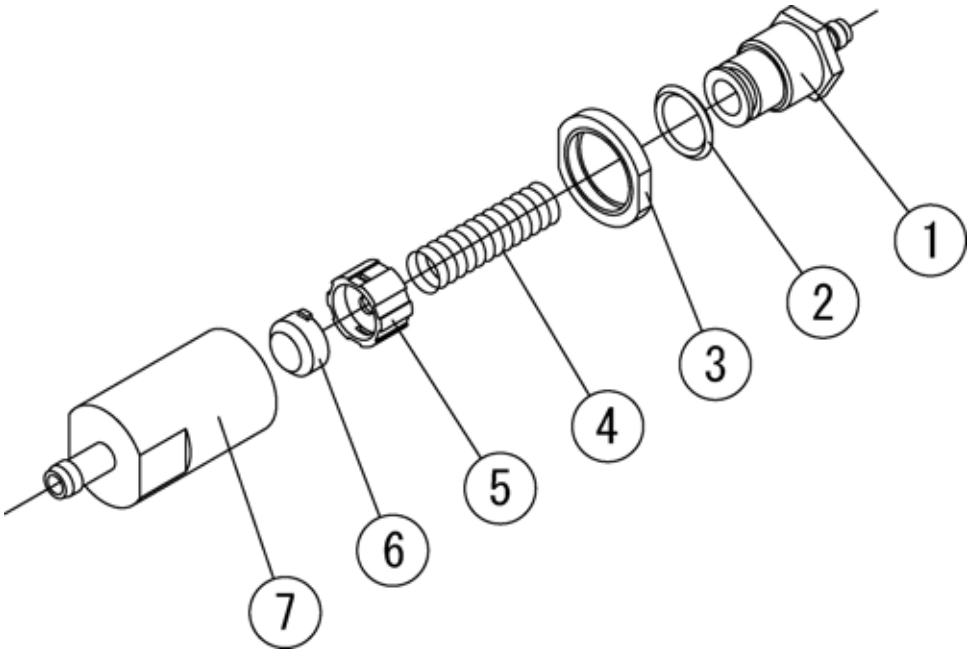
No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Relief valve(RV2）				Compatible with 0-401-121
	Relief valve(RV3）				Compatible with 0-401-121
1	Casing B	PPS			
2	O ring	P14 silicone rubber	0-401-	061	
3	Nut	PPS	0-401-	117	
4	Compression spring	Stainless Steel	0-401-	123	
5	Rubber stopper		0-401-	119	
6	Rubber stopper		0-401-	119	
7	Casing A	PPS	0-401-	120	

NOTE）Since the parts with hatched “No.” on the list above constitute as an assembly, each part cannot be purchased separately.

NOTE）This Type 1 Relief valve production is stopped. Please use type 2 Relief valve.

11.4.16.5 Relief valve (RV1,2 and 3)(Type2)

NOTE）RV3 is NOT equipped the models with serial No.04A0208E or later.



No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Relief valve		0-401-	121	Compatible with RV1, 2 and 3 but see NOTE1.
1	Casing B	PPS	0-401-	116	
2	O ring	P14 silicone rubber	0-401-	061	
3	Nut	PPS	0-401-	117	
4	Compression spring	Stainless Steel	0-401-	124	
5	Rubber stopper		0-401-	119	
6	Rubber stopper		0-401-	119	
7	Casing A	PPS	0-401-	120	

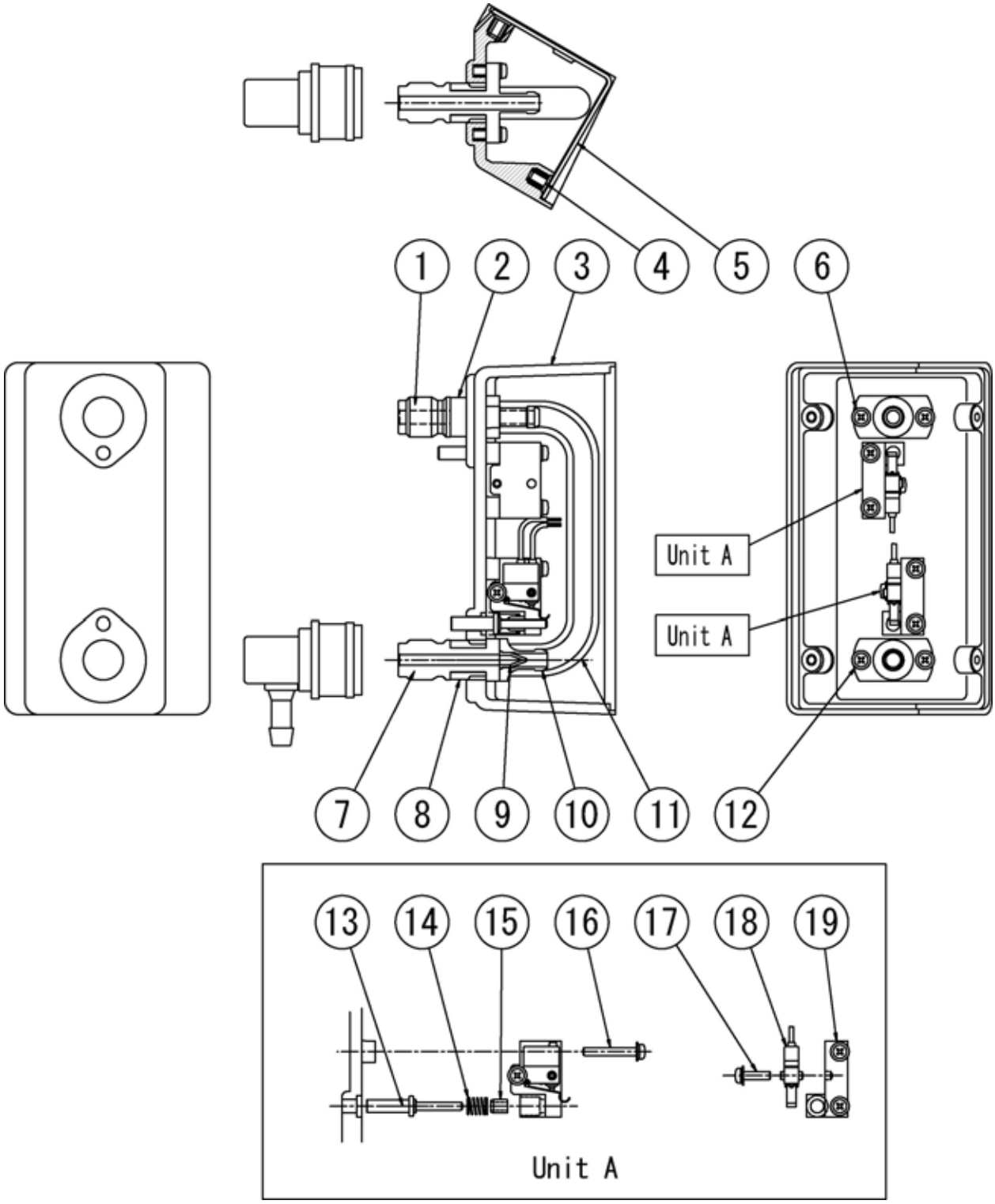
NOTE1) **RV1, RV2 and RV3** are same equipment however there are **different adjustment**. **Please adjust it for each purpose when you install it to machine.**

NOTE）Since the parts with hatched “No.” on the list above constitute as an assembly, each part cannot be purchased separately.

11.4.17. Dialyzer coupler holder

11.4.17.1 Dialyzer coupler holder (Type 1)

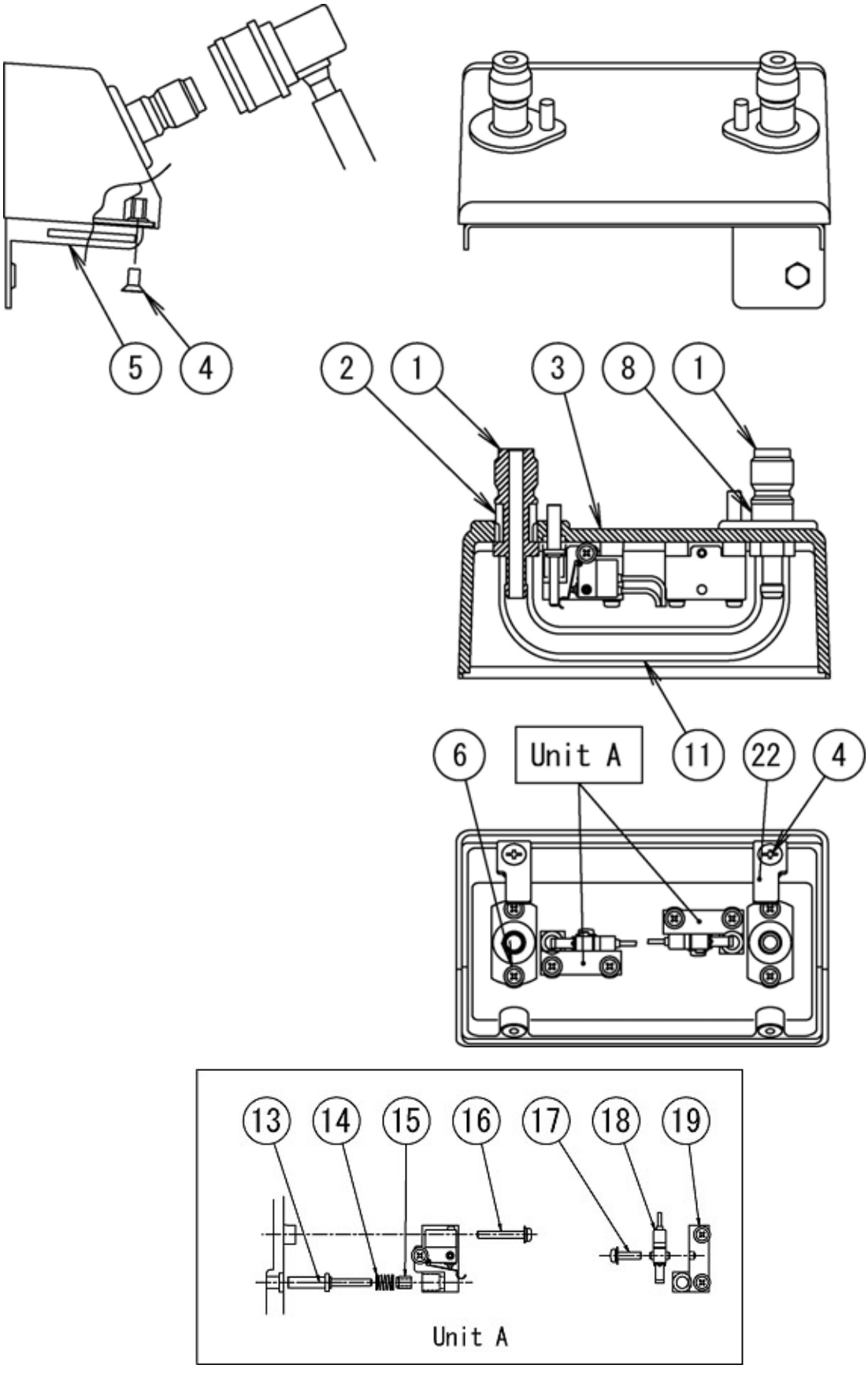
NOTE） This type of coupler holder is equipped the models with serial No. before or equal 06A00**E, and 06B00**E.



No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Coupler holder Assy		0-404-	001	
1	Coupler receiver (A)	Stainless Steel	0-404-	002	
2	Fixing bush (Red)	NBR	0-404-	003	
3	Holder body	ABS	0-404-	004	
4	Cross recessed flat head screw	Stainless Steel M4×6	0-401-	125	
5	Back cover	Stainless Steel	0-404-	005	
6	Cross recessed head pan screw	Stainless Steel P3 M3×10	0-401-	028	
7	Coupler receiver (B)	Stainless Steel	0-404-	006	
8	Fixing bush (Blue)	NBR	0-404-	007	
9	Check valve	FDB-003	0-404-	008	
10	Packing gland	SCS14	0-404-	009	
11	Silicon tube	5×11 L=135	0-404-	010	
12	Cross recessed head pan screw	Stainless Steel P3 M3×12	0-401-	127	
13	Sensor pin	Stainless Steel	0-404-	011	
14	Spring	SA065-03	0-404-	012	
15	Oil less bush	80-0305	0-404-	013	
16	Cross recessed head pan screw	P2 M3×20	0-401-	128	
17	Cross recessed head pan screw	P3 M3×10	0-401-	028	
18	Limit switch	D2HW-C233M	0-404-	014	
19	Sensor bracket	Stainless Steel	0-404-	015	
20	Packing	NBR (white)	0-401-	200	

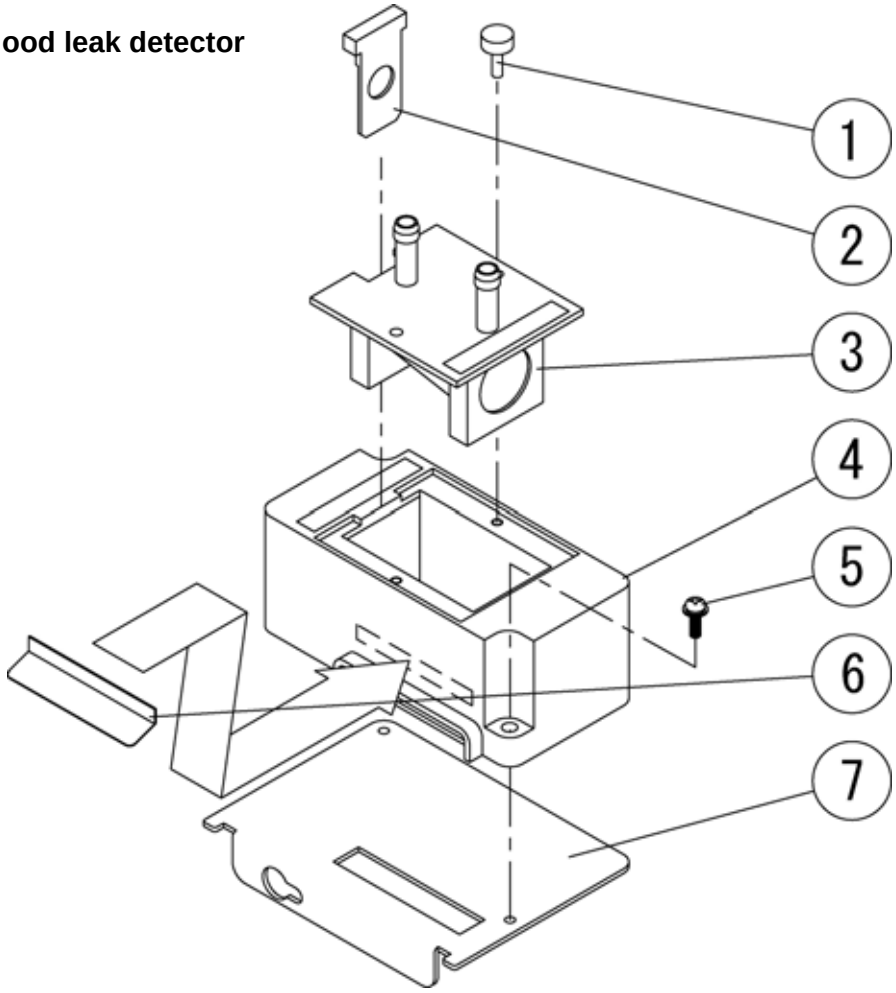
11.4.17.2 Dialyzer coupler holder (Type 2)

NOTE）This type of coupler holder is equipped the models with serial No. 06C00**E / 06D00**E or later.



No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Coupler holder Assy		0-404-	001	
1	Coupler fastening device (A)	Stainless Steel	0-404-	002	
2	Fixing bush (Red)	NBR	0-404-	003	
3	Holder body	ABS	0-404-	004	
4	Cross recessed flat head screw	Stainless Steel M4×6	0-401-	125	
5	Bracket	Stainless Steel	0-404-	108	
6	Cross recessed head pan screw	Stainless Steel P3 M3×10	0-401-	028	
8	Fixing bush (Blue)	NBR	0-404-	007	
11	Silicon tube	5×11 L=130	0-404-	109	
13	Sensor pin	Stainless Steel	0-404-	011	
14	Spring	SA065-03	0-404-	012	
15	Oil less bush	80-0305	0-404-	013	
16	Cross recessed head pan screw	P2 M3×20	0-401-	128	
17	Cross recessed head pan screw	P3 M3×10	0-401-	028	
18	Limit switch	D2HW-C233M	0-404-	014	
19	Sensor bracket	Stainless Steel	0-404-	015	
20	Packing (Square)	NBR (white)	0-401-	200	
21	Packing (Oval)	NBR (white)	0-401-	110	
22	Fixing Bracket	Stainless Steel	0-401-	111	1 Pair

11.4.18. Blood leak detector



No.	Name	Standard & Material	NIPRO order Code No.		Remarks
	Blood leak sensor Assy		0-401-	129	Assembly of 1, 2, 3,4 and 6
1	Stop screw	Finish machine screw M3	0-401-	130	
2	Cover plate		0-401-	131	
3	BLD Dialysate flow pass		0-401-	132	3 and 4 constitute as an assembly
4	BLD Body		0-401-	132	3 and 4 constitute as an assembly
5	Cross recessed head screw	P3 M4×16	0-401-	133	
6	Water proof cover		0-401-	134	
7	Bracket		0-401-	135	

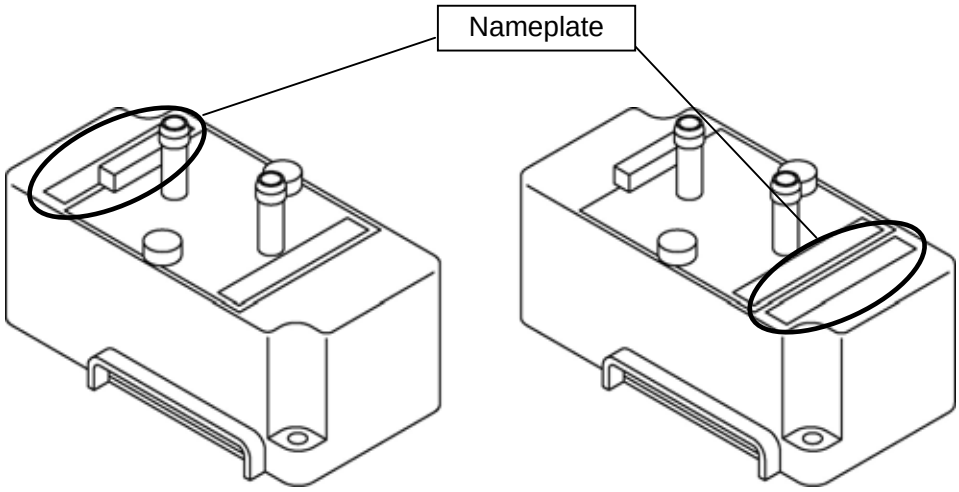
NOTE） Since the parts with hatched “No.” on the list above constitute an assembly, each part cannot be purchased separately.

⚠CAUTION

The window of BLD dialysate flow pass is made of glass, and it cracks easily. When cleaning BLD dialysate flow pass, rinse with disinfectant without disassembling the machine.

NOTE

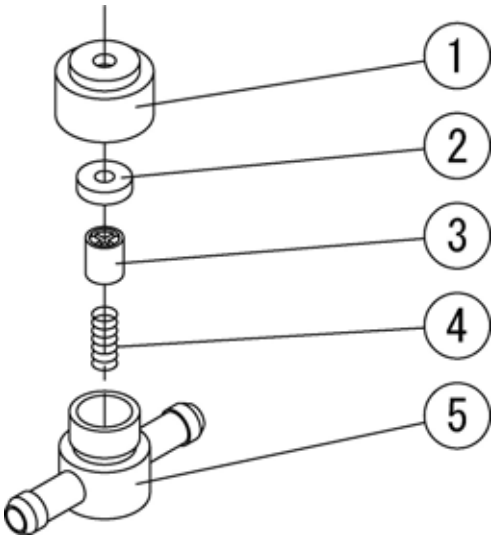
Blood Leak Detector (Serial No. 0663 or later) equips Analog Voltage test function. You can apply this function by selecting to “1” though “Maker”>”Machine type”>”BLD” .



Old Type (Type 1)
Serial No. 0662 or before

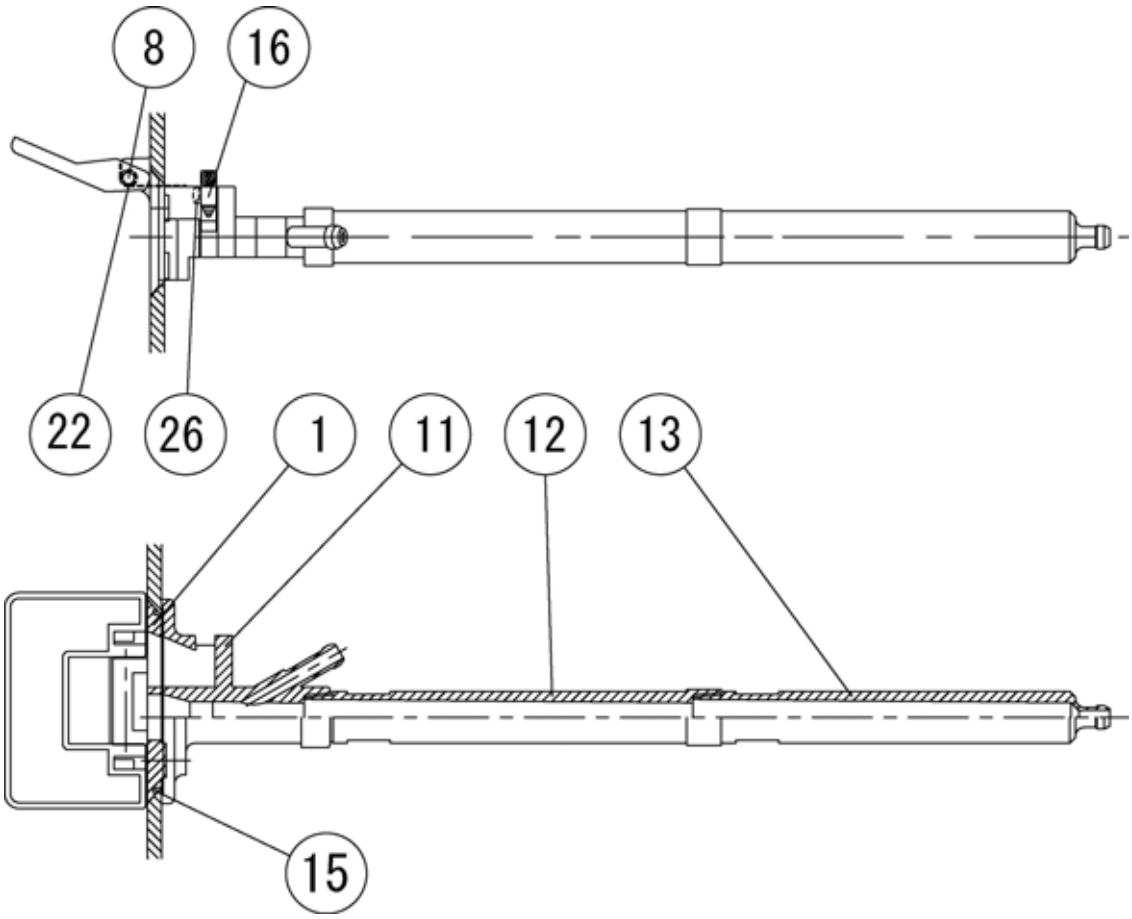
New Type (Type 2)
Serial No. 0663 or later

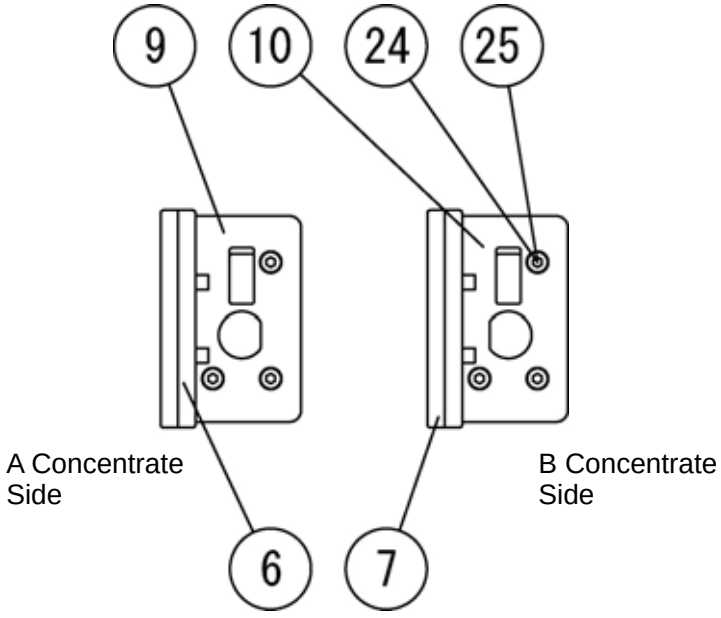
11.4.19. Sample port

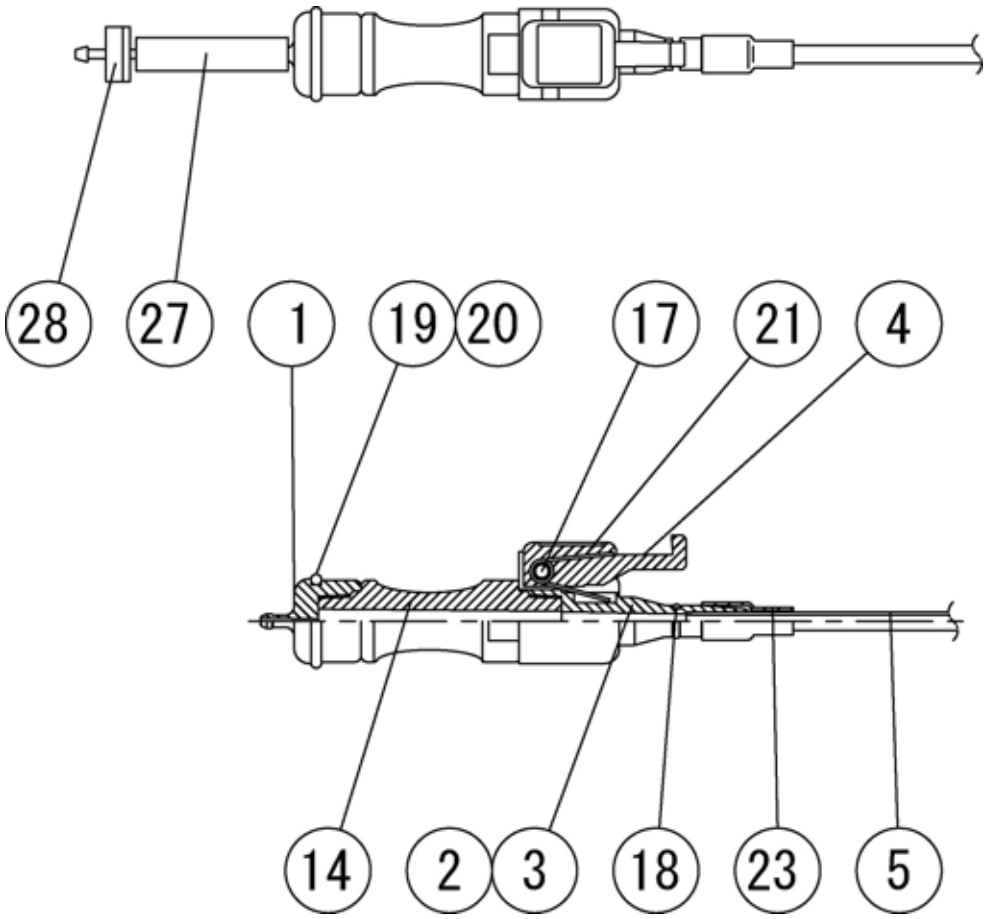


No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Sample port		0-401-	136	
1	Sample port lid	PSU	0-401-	137	
2	Packing	Silicone rubber	0-401-	138	
3	Rod	PSU	0-401-	139	
4	Spring	Stainless Steel	0-401-	140	
5	Sample port body	PSU	0-401-	141	

11.4.20. Concentrate sheath







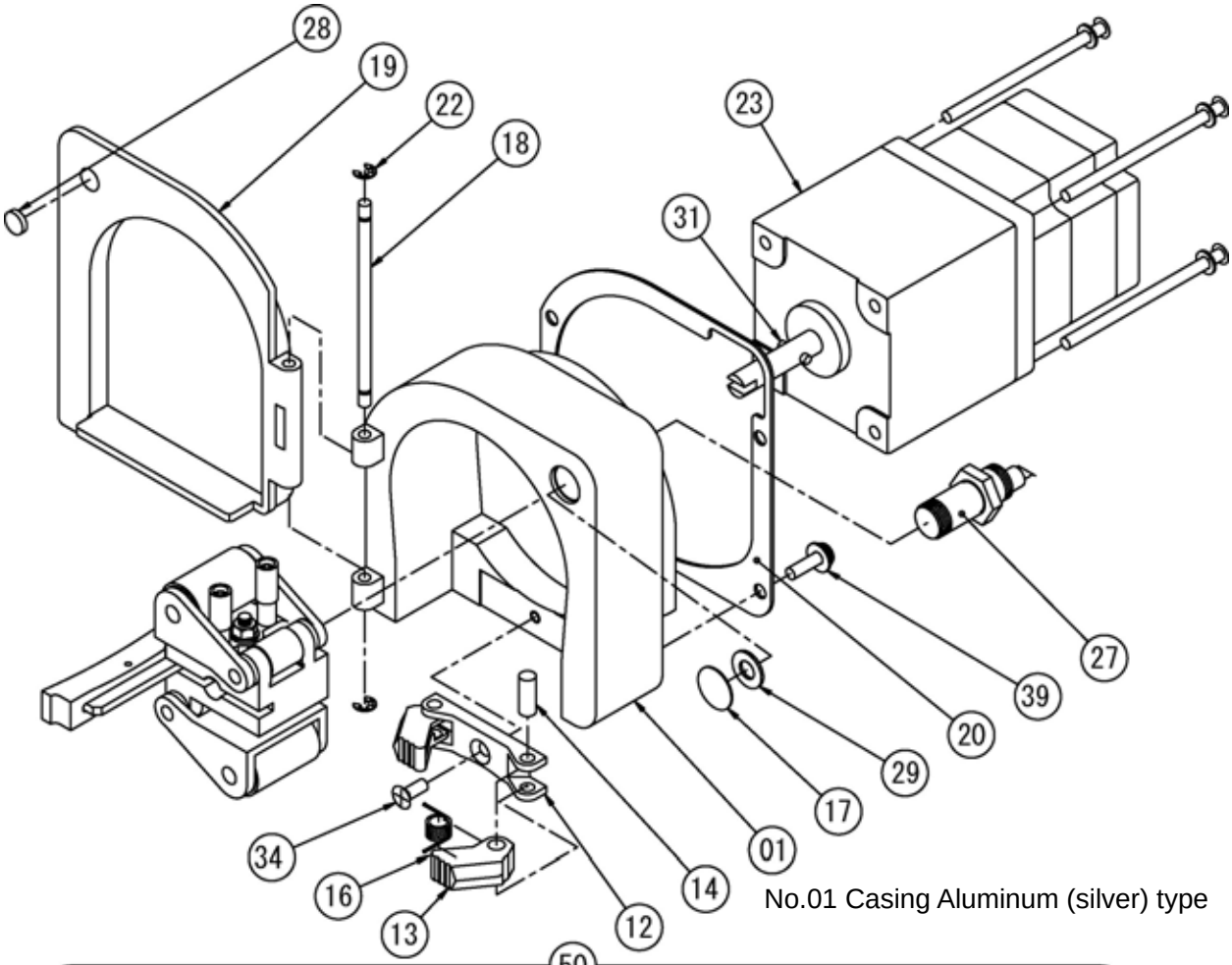
No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	A concentrate nozzle Assy		0-401-	142	Set of No. 1, 2, 4, 5, 14, 17, 18, 19, 21, 23
	B concentrate nozzle Assy		0-401-	143	Set of No. 1, 3, 4, 5, 14, 17, 18, 20,21,23
	Sheath Assy		0-401-	144	Set of No. 11,12,13,16,26
	A concentrate sheath door Assy		0-401-	145	Set of No. 6,8,9,15,22
	B concentrate sheath door Assy		0-401-	146	Set of No. 7,8,10,15,22
1	Tube joint			-	
2	A liquid nozzle (only top)		0-401-	205	With O-ring (No.18)
3	B liquid nozzle (only top)		0-401-	206	With O-ring (No.18)
4	Stopper			-	
5	Tube for nozzle	PE	0-401-	147	
6	A concentrate sheath door			-	
7	B concentrate sheath door			-	
8	Shaft			-	
9	A concentrate table cover			-	

No.	Description	Standard /Material	NIPRO order Code No.		Remarks
10	B concentrate table cover			-	
11	Rinse chamber A			-	
12	Rinse chamber B			-	
13	Rinse chamber C			-	
14	Nozzle handle			-	
15	Packing			-	
16	Micro-switch	D2HW-C233	0-401-	148	
17	Spring pin			-	
18	O-ring	P8 silicone rubber	0-401-	149	
19	Red color ring		0-401-	150	
20	Blue color ring		0-401-	151	
21	Torsion spring			-	
22	Torsion spring			-	
23	Silicone tube	φ5×7	0-401-	152	
24	Hex. socket head bolt	Stainless Steel M4×6	0-401-	153	
25	Cap for hex. socket head bolt	BTCSW4	0-401-	154	
26	Cross recessed head screw	P3 M3×12	0-401-	127	
27	Silicone Tube	φ2.5×11 Double tube	0-401-	224	
28	Filter (FL6 or 7)		0-401-	176	

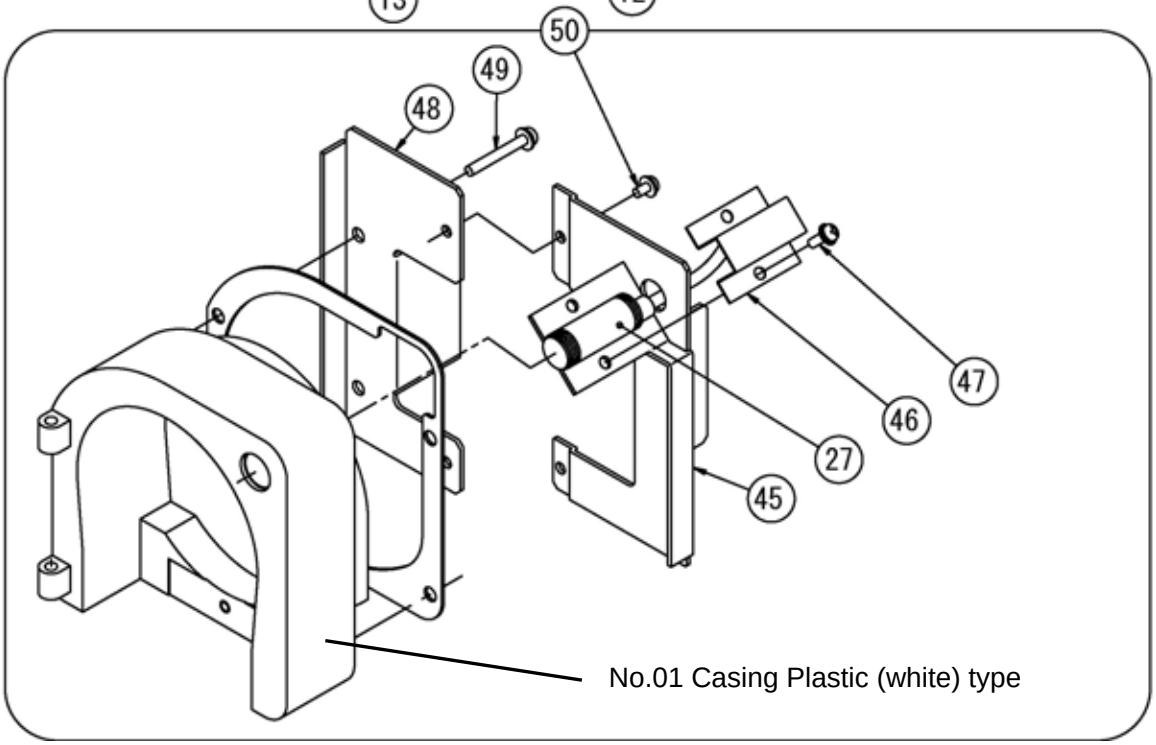
NOTE） Since the parts with hatched “No.” on the list above constitute as an assembly, each part cannot be purchased separately.

11.4.21. Blood pump

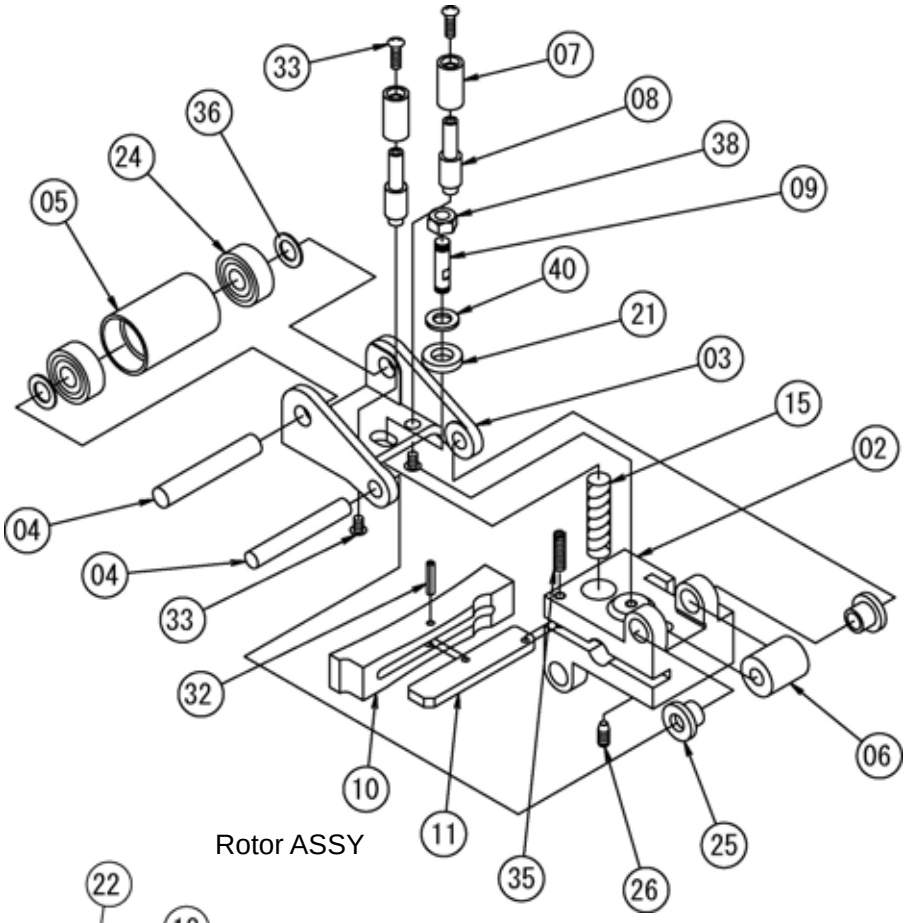
NOTE) The Blood Pump of this type is equipped the models with serial No. equal or after 03A00101E.



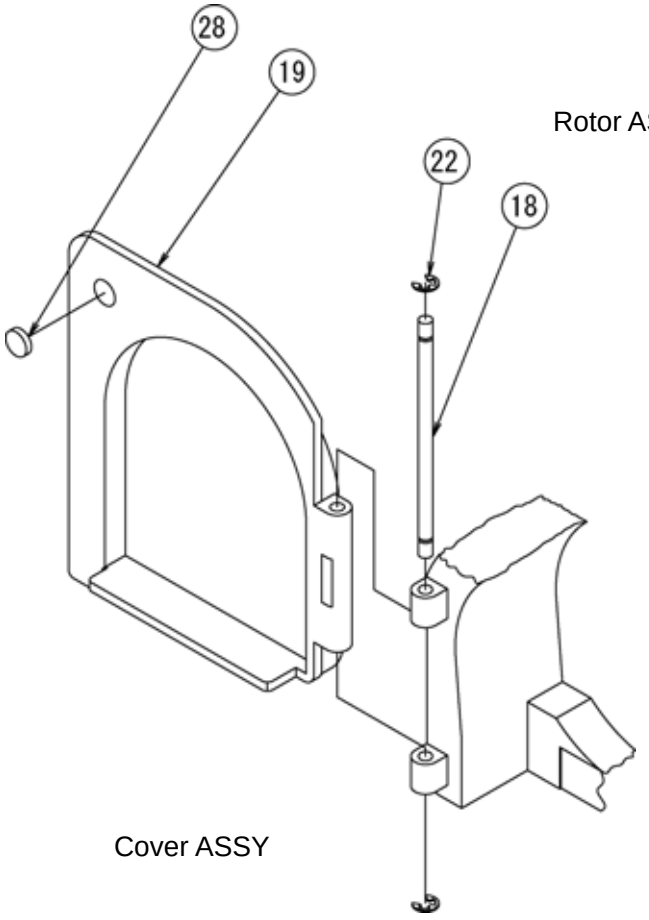
No.01 Casing Aluminum (silver) type



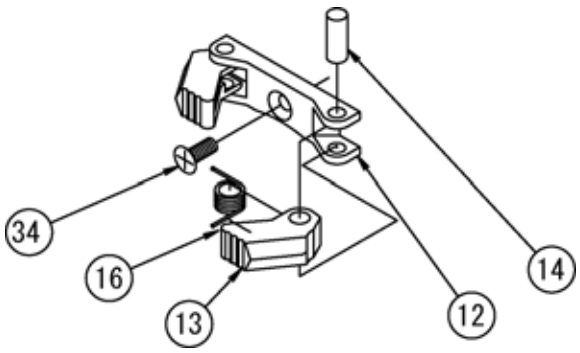
No.01 Casing Plastic (white) type



Rotor ASSY



Cover ASSY



Clamp ASSY

No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Blood pump ASSY		0-404-	016	This unit is included adapter harness.
	Rotor ASSY		0-404-	017	Set of No. 2 to 11, 15, 21, 24, 25, 26, 32, 33, 35, 38

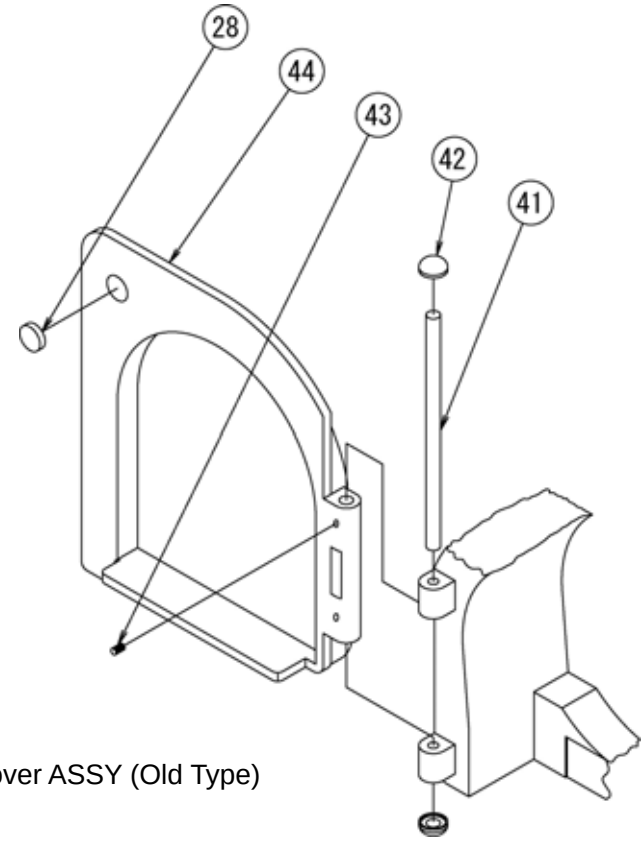
No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Clamp ASSY		0-404-	018	Set of No. 12,13,14,16
	Cover ASSY		0-404-	037	Set of No. 19,28
	Casing	AC7A	0-404-	020	Aluminum type (Silver)
1	Casing	PPS	0-404-	020	Plastic type (White) Compatible with Aluminum type
2	Rotor body	AC7A		-	
3	Rotor bracket	AC7A		-	
4	Shaft A	Stainless Steel		-	
5	Roller A	Stainless Steel		-	
6	Roller B	POM		-	
7	Roller C	POM	0-404-	021	
8	Shaft B	Stainless Steel	0-404-	022	
9	Pin A	Stainless Steel	0-404-	023	
10	Handle	POM		-	
11	Handle plate	Stainless Steel		-	
12	Clamp base	POM		-	
13	Clamp	POM		-	
14	Clamp shaft	Stainless Steel		-	
15	Spring	Stainless Steel	0-404-	024	
16	Torsion spring	Stainless Steel		-	
17	Rubber cover	NBR	0-404-	025	
18	Shaft	Stainless Steel	0-404-	038	
19	Cover	PSU		-	
20	Packing	NBR	0-404-	027	
21	Urethane washer	Urethane	0-404-	028	
22	E ring stopper	Stainless Steel	0-404-	039	
23	Brush-less DC motor	24V, 20W	0-404-	030	
24	Bearing	625ZZ		-	
25	Bush	80F-0505		-	
26	Ball plunger	BSX4	0-404-	031	
27	Safety magnetic SW	BNS120-11z	0-404-	032	
28	Magnet	$\phi 8 \times 2$		-	
29	Plain washer	SS400 M6	0-404-	033	
31	Spring pin	Stainless Steel $\phi 3 \times L12$	0-404-	034	
32	Spring pin	Stainless Steel $\phi 2 \times L10$		-	
33	Cross recessed head binding screw	Stainless Steel M2.5×4	0-401-	155	
34	Cross recessed head pan screw	Stainless Steel M4×10	0-401-	156	
35	Hex. socket set screw	Stainless Steel M3×12	0-401-	157	
36	Wave washer	Stainless Steel			

No.	Description	Standard /Material	NIPRO order Code No.		Remarks
38	U-nut	Stainless Steel M4	0-404-	035	
39	Cross recessed head screw	Stainless Steel P3 M4×16	0-401-	017	
40	Plastic washer		0-404-	036	
45	BP shield panel (L)	Stainless Steel	0-401-		
46	BP sensor shield panel	Stainless Steel	0-401-		
47	Cross recessed head screw	Stainless Steel P4 M3×6	0-401-		
48	BP shield panel (R)	Stainless Steel	0-401-		
49	Cross recessed head screw	Stainless Steel P3 M4×30	0-401-		
50	Cross recessed head screw	Stainless Steel P3 M3×6	0-401-		

NOTE） Since the parts with hatched “No.” on the list above constitute as an assembly, each part cannot be purchased separately.

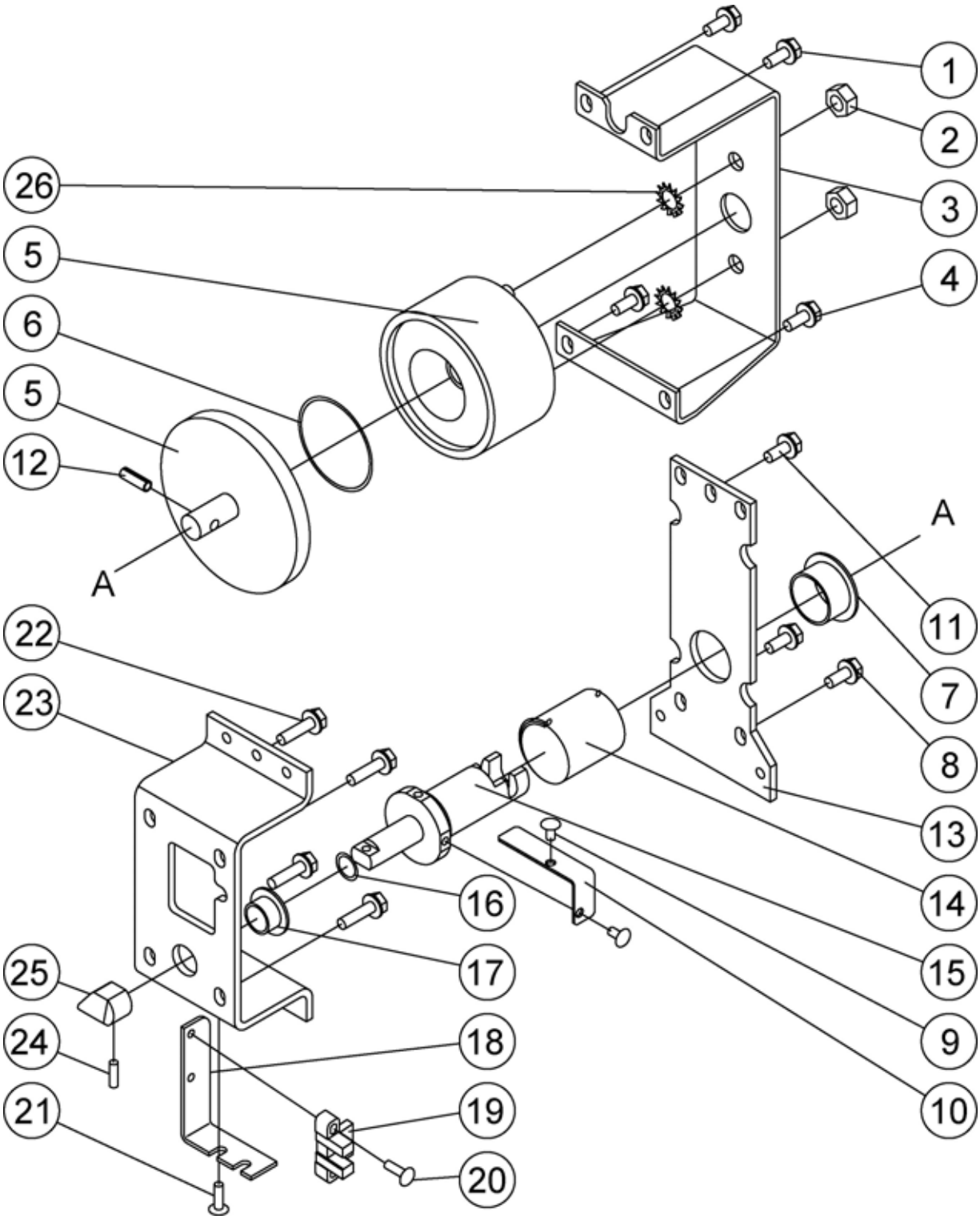
NOTE) The cover Assy of BP rotor (No. 41, 42, 43, 44 see below) is equipped the models with serial No. before or equal 03A00100E.

No.	Description	Standard /Material	NIPRO order Code No.		Remarks
41	Shaft (Old Type)	Stainless Steel	0-404-	019	
42	Shaft Cover	PP	0-404-	029	
43	Hex. socket set screw	Stainless Steel M3×3	0-401-	158	
44	Cover (Old Type)	PSU			Compatible with present model (No.18, 19, 22)



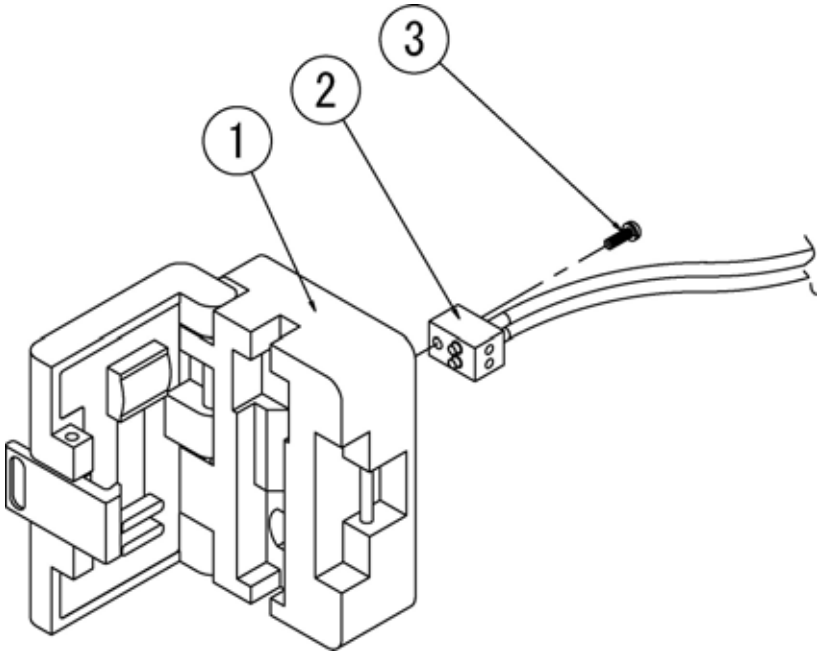
Cover ASSY (Old Type)

11.4.22. Venous clamp



No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Venous clamp Assy		0-404-	041	
1	Cross-recessed head hex. head bolt	Stainless Steel P3 M4×12	0-401-	159	
2	Hex. nut	M6	0-401-	020	
3	Bracket C	Stainless Steel	0-404-	042	
4	Cross-recessed hex. head bolt	Stainless Steel P3 M4×12	0-401-	159	
5	Solenoid	7SC	0-404-	043	
6	O ring	C0 7771	0-404-	044	
7	Bush	80F-1810	0-404-	045	
8	Cross-recessed hex. head bolt	Stainless Steel P3 M4×12	0-401-	159	
9	Cross recessed head screw	Stainless Steel P3 M3×5	0-401-	207	
10	Sensor detection plate	Stainless Steel	0-404-	046	
11	Cross-recessed hex. head bolt	Stainless Steel P3 M4×12	0-401-	159	
12	Spring pin	φ4×18	0-404-	047	
13	Bracket C	Stainless Steel	0-404-	048	
14	Compression spring	A22-01	0-404-	049	
15	Shaft	Stainless Steel	0-404-	050	
16	O ring	P10 NBR	0-404-	051	
17	Bush	80F-1006	0-404-	052	
18	Sensor bracket	SUS304	0-404-	053	
19	Photo sensor	EE-SX671	0-404-	054	
20	Cross recessed head screw	Stainless Steel P2 M3×10	0-401-	215	
21	Cross recessed head screw	Stainless Steel P3 M3×5	0-401-	208	
22	Cross-recessed hex. head bolt	Stainless Steel P3 M4×16	0-401-	162	
23	Bracket A	Stainless Steel	0-401-	055	
24	Hex. socket set screw	Stainless Steel M3×8	0-404-	056	
25	Pusher	POM	0-404-	057	
26	Tooth lock washer	M6	0-404-	112	Used TYPE 3 machine only

11.4.23. Air bubble and Blood color detector unit



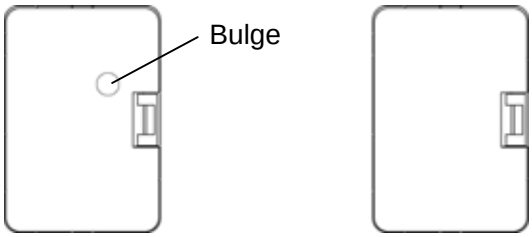
No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Bubble/blood color detector unit		0-401-	163	
1	Bubble detector unit ASSY	ABS Stainless Steel	0-401-	164	
2	Blood color deector optical fiber ASSY		0-401-	165	Blood color sensor amplifier (0-402-074) included.
3	Cross-recessed head screw	P2 M3×15	0-401-	166	

NOTE

Bubble detector unit ASSY assembled as TYPE 3 machine is measure for EMC.

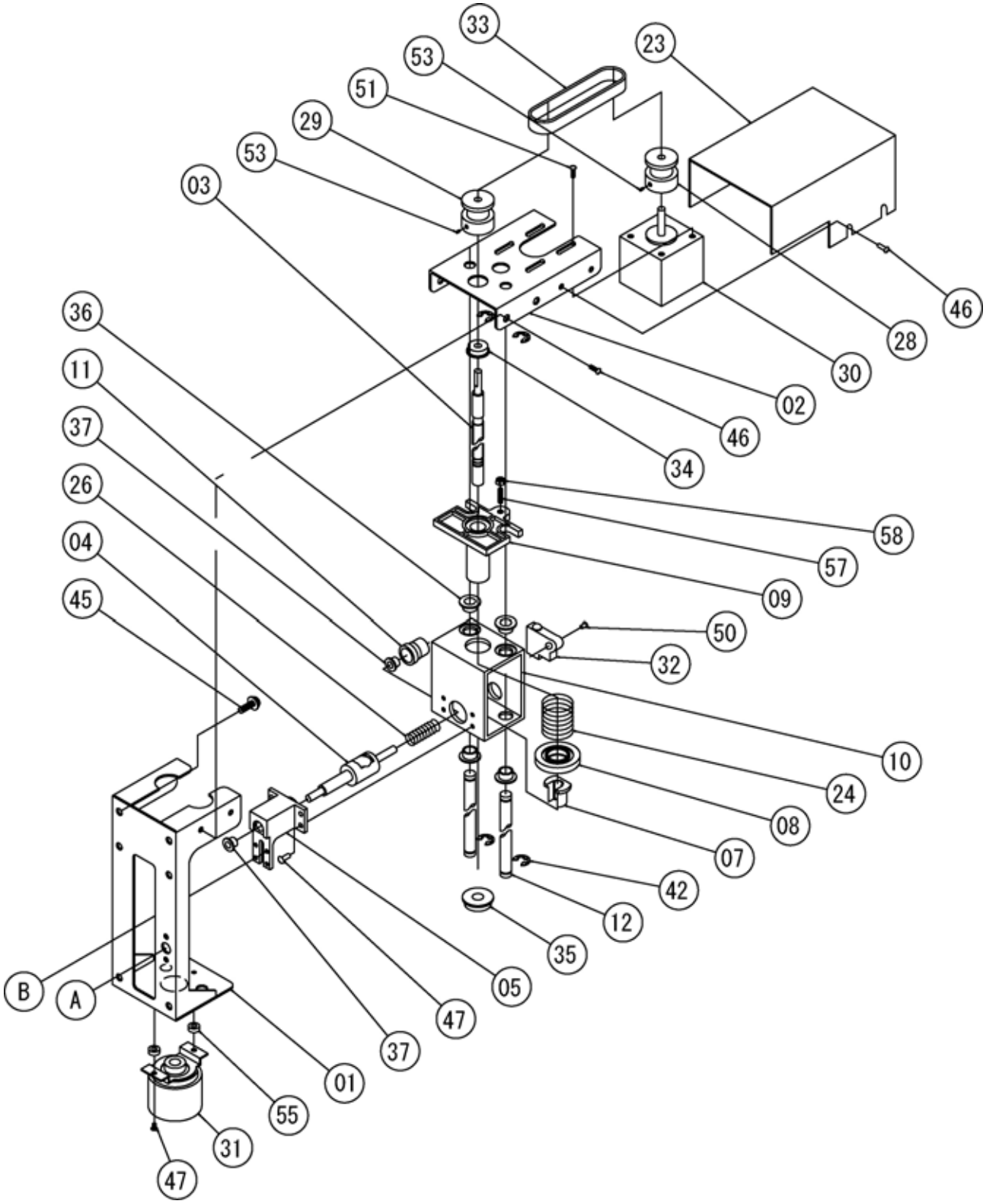
⚠CAUTION

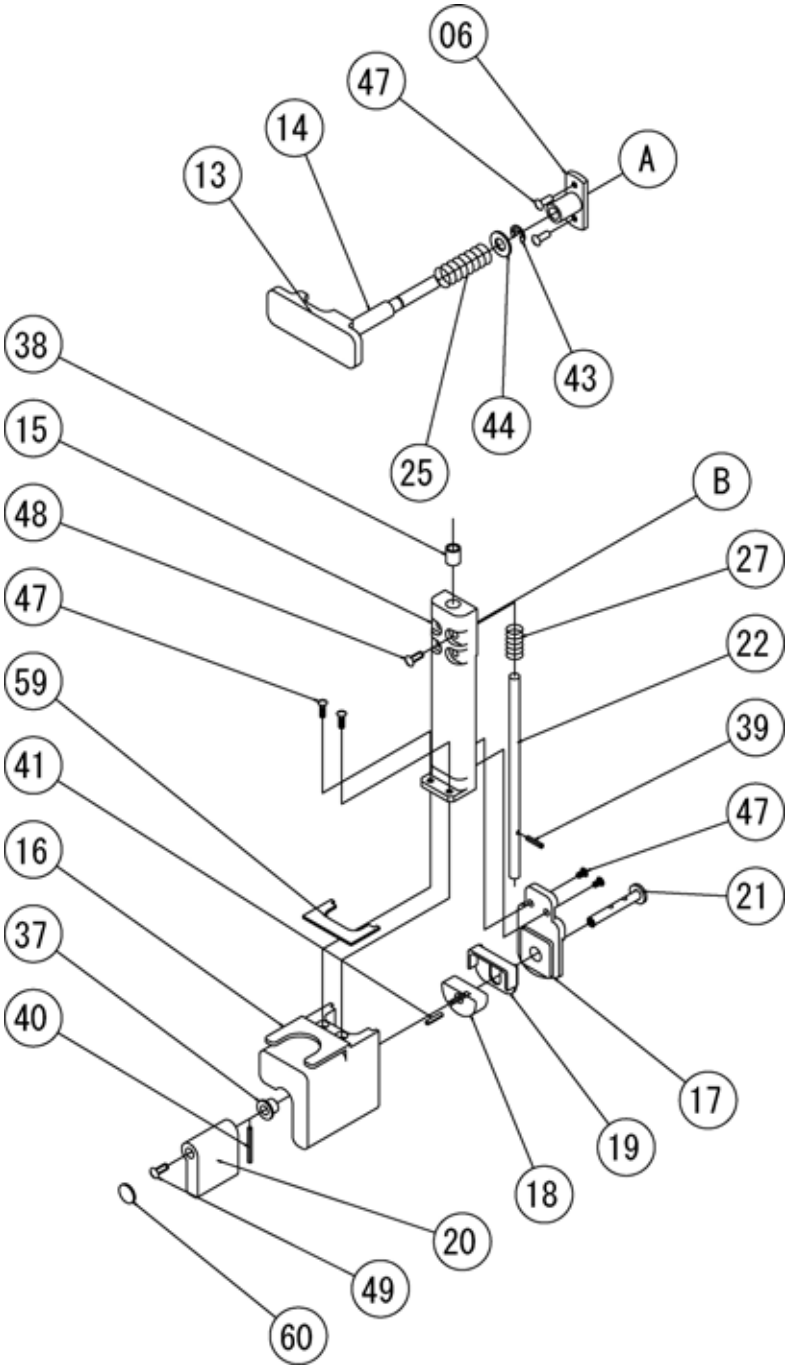
Don't install the unit for the machines, TYPE 1 or TYPE 2 to the machine of TYPE 3.



For TYPE 3 Machines (Measures for EMC)	For TYPE 1 or 2 Machines (No bulge)

11.4.24. Syringe pump




06
47
14
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19
18
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49
60

No.	Description	Standard /Material	NIPRO order Code No.		Remarks
	Syringe pump Assy		0-404-	058	
1	Syringe bracket	Stainless Steel	0-404-	059	
2	Motor mounting bracket	Stainless Steel	0-404-	060	
3	Syringe drive screw		0-404-	061	
4	Shaft	Stainless Steel	0-404-	062	
5	Connection bracket	SCS13	0-404-	063	
6	Positioning bracket	Stainless Steel	0-404-	064	
7	Half nut	Stainless Steel	0-404-	065	
8	Nut	Stainless Steel	0-404-	066	
9	Spring holder	POM	0-404-	067	
10	Guide	Aluminum	0-404-	068	
11	Spring case	Stainless Steel	0-404-	069	
12	Guide shaft	Stainless Steel	0-404-	070	
13	Syringe fixing lever	ABS	0-404-	071	
14	Syringe fixing shaft	Stainless Steel	0-404-	071	
15	Pusher guide	Aluminum	0-404-	073	
16	Pusher (upper part)	ABS	0-404-	074	
17	Pusher (lower side)	ABS	0-404-	075	
18	Pusher	POM	0-404-	076	
19	Slide bracket	POM	0-404-	077	
20	Handle	ABS	0-404-	078	
21	Rotating shaft	Stainless Steel	0-404-	079	
22	Pushing rod	Stainless Steel	0-404-	080	
23	Actuator cover	Stainless Steel	0-404-	081	
24	Spring (A)	Stainless Steel	0-404-	082	
25	Spring (B)	Stainless Steel	0-404-	083	
26	Spring (C)	Stainless Steel	0-404-	084	
27	Spring (D)	Stainless Steel	0-404-	085	
28	Pulley (A)		0-404-	086	
29	Pulley (B)		0-404-	087	
30	3-phase stepping motor	KT42JM06-551	0-404-	088	
31	Rotary encoder	HES-10-2HC	0-404-	089	
32	Micro-switch	D2HW-C202M	0-404-	090	
33	Timing belt (U type)	70×L037E	0-404-	091	
34	Flanged radial ball bearing	FL605ZZ	0-404-	092	
35	Flanged radial ball bearing	FL698ZZ	0-404-	093	
36	Oil-less bush	80F-0808	0-404-	094	
37	Oil-less bush	80F-0505	0-404-	095	

No.	Description	Standard /Material	NIPRO order Code No.		Remarks
38	Oil-less bush	80B-0508	0-404-	096	
39	Spring pin	ϕ2×10L	0-404-	097	
40	Spring pin	ϕ2×20L	0-404-	098	
41	Spring pin	ϕ2×14L	0-404-	099	
42	E-shaped retaining ring: ϕ6		0-404-	100	
43	E-shaped retaining ring: ϕ4		0-404-	101	
44	Washer M6		0-404-	102	
45	Cross-recessed hex. head bolt	M4×10L	0-401-	167	
46	Cross-recessed head pan screw	P3 M4×6L	0-401-	168	
47	Cross-recessed head pan screw	P2 M4×6L	0-401-	169	
48	Cross-recessed head pan screw	P3 M3×14L	0-401-	170	
49	Cross-recessed head pan screw	P2 M2×6L	0-401-	171	
50	Cross-recessed head pan screw	P3 M3×10L	0-401-	028	
51	Cross-recessed head pan screw	P3 M3×6L	0-401-	068	
53	Hex. socket set screw	M3×5L	0-401-	172	
55	Metal washer	WSSS8-4-3	0-404-	103	
57	Hex. socket set screw	M4×12L	0-401-	173	
58	Hex. nut	M4	0-401-	010	
59	Screw cover plate (A)		0-404-	104	
60	Screw cover plate (B)		0-404-	105	

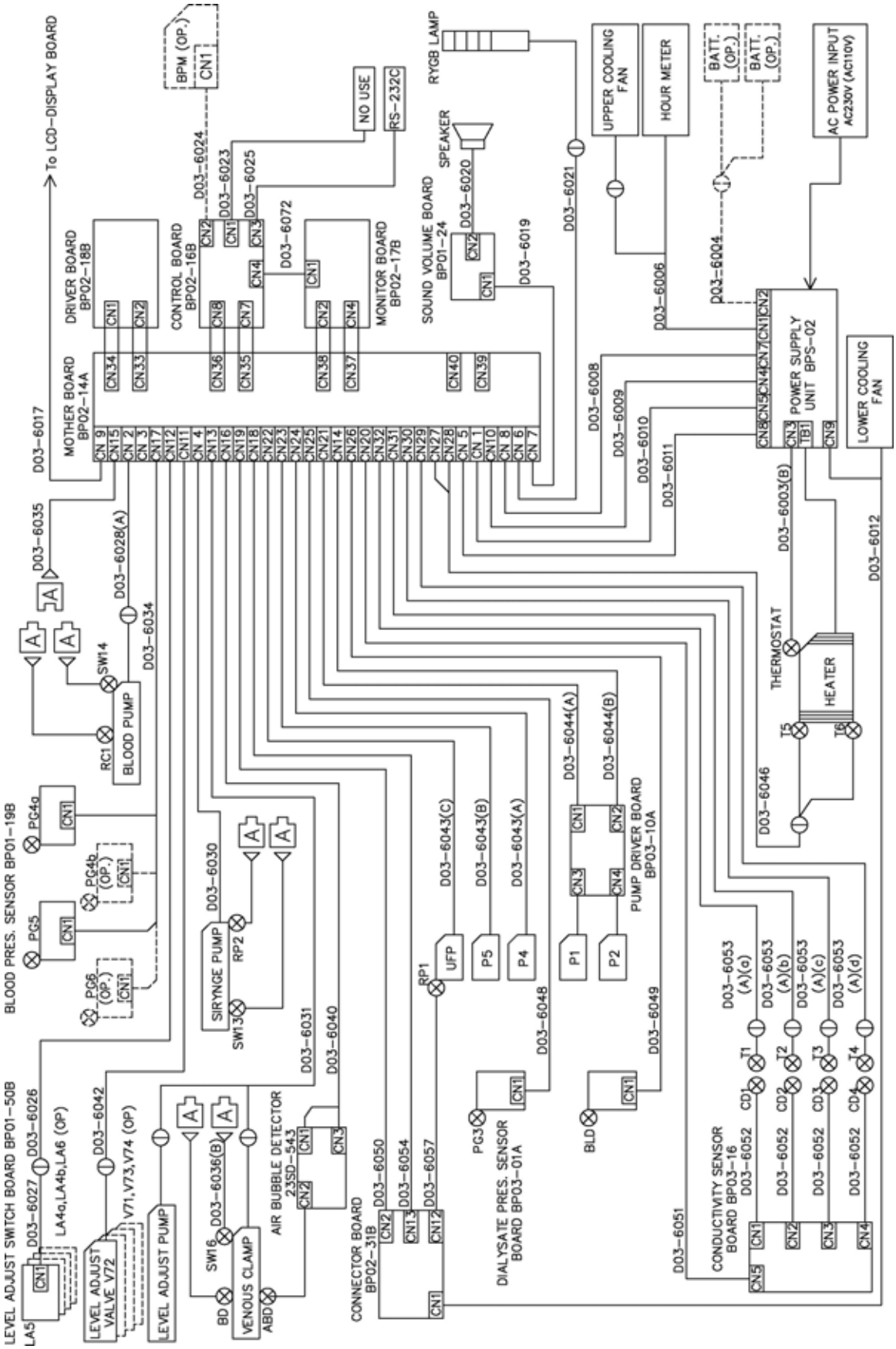
NOTE） Since the parts with hatched “No.” on the list above constitute as an assembly, each part cannot be purchased separately.

11.5. Maintenance Parts - Harness

11.5.1. Machine type 1

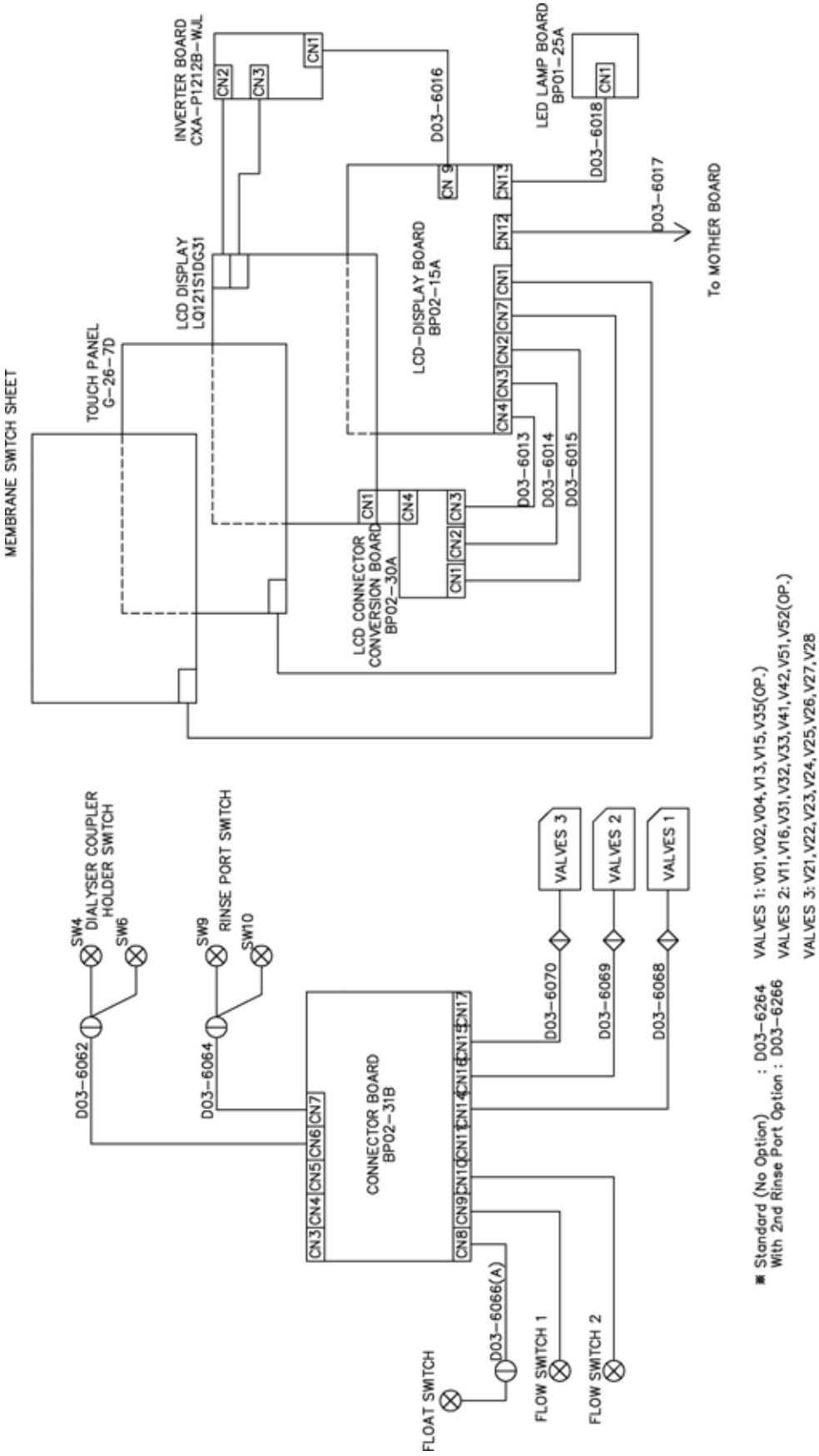
NOTE) This harness drawing is applicable the models with serial No. 03A0001 – 04A0207.

11.5.1.1 Power supply section



11.5.1.2 Dialysate line section and around operation panel

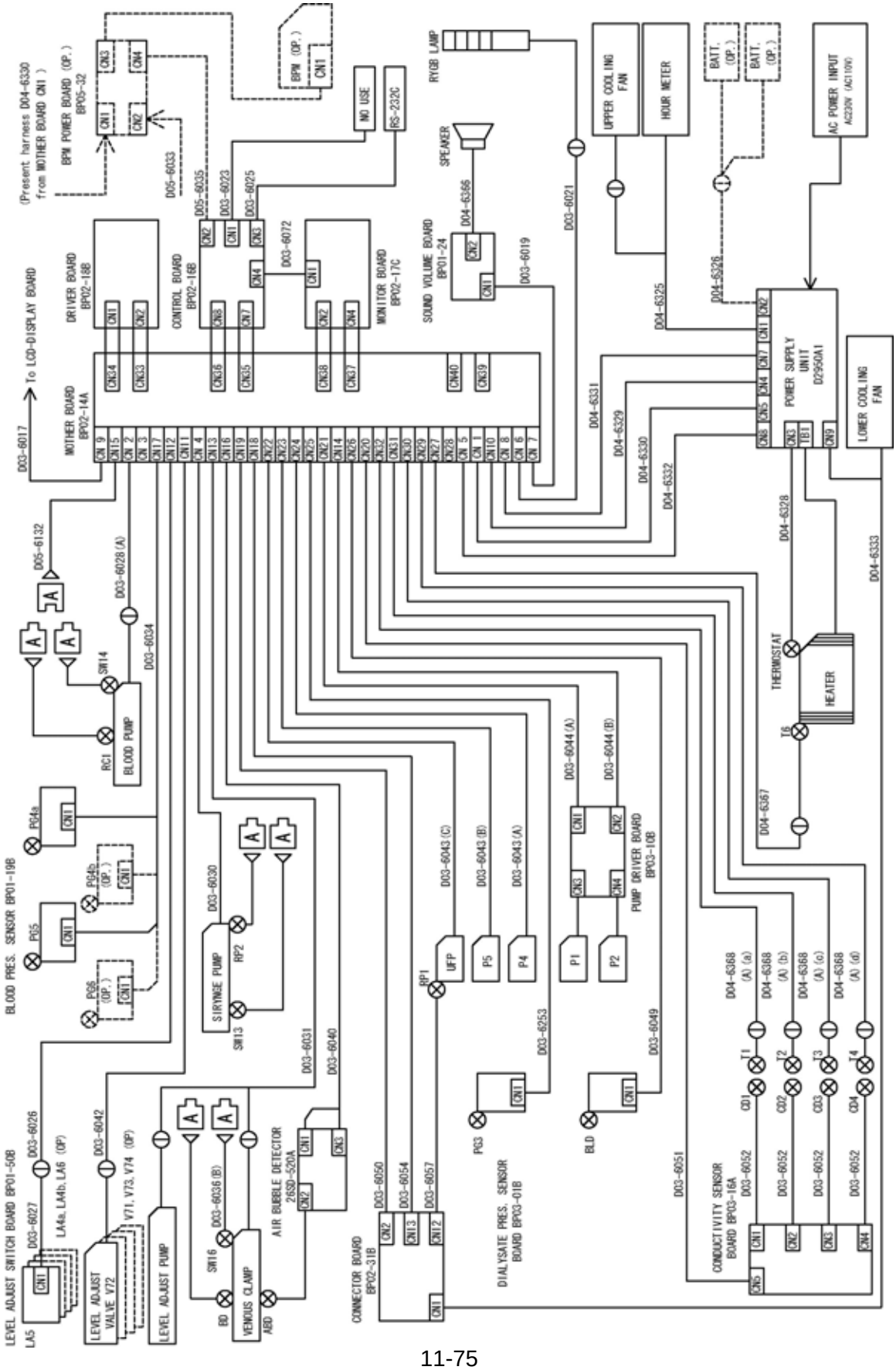
NOTE) This harness drawing is applicable the models with serial No. 03A0001 – 04A0207.



11.5.2. Machine type 2

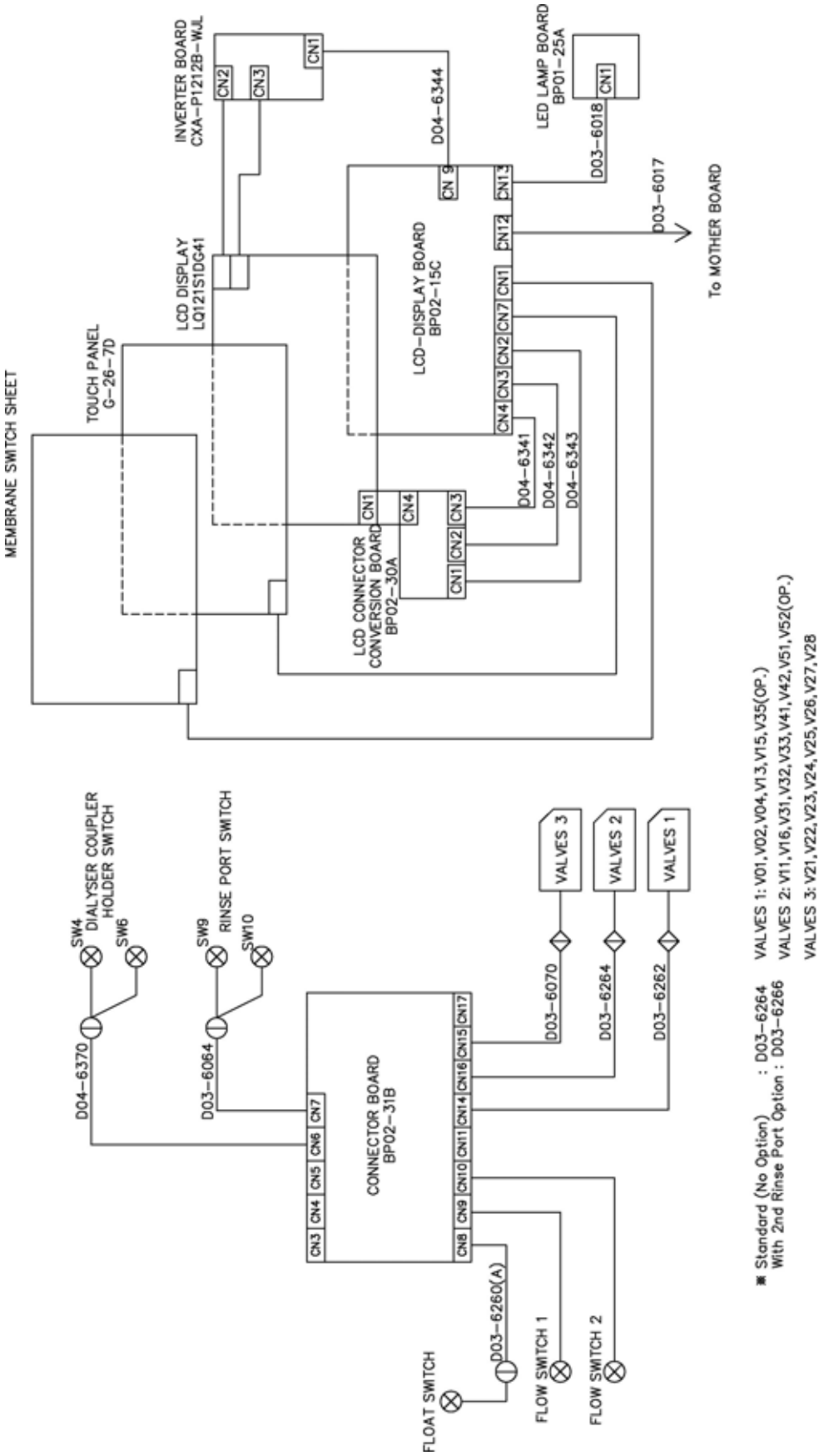
11.5.2.1 Power supply section

NOTE) This harness drawing is applicable the models with serial No. 04A0208 - 06A00** or -06B00**.



11.5.2.2 Dialysate line section and operation panel

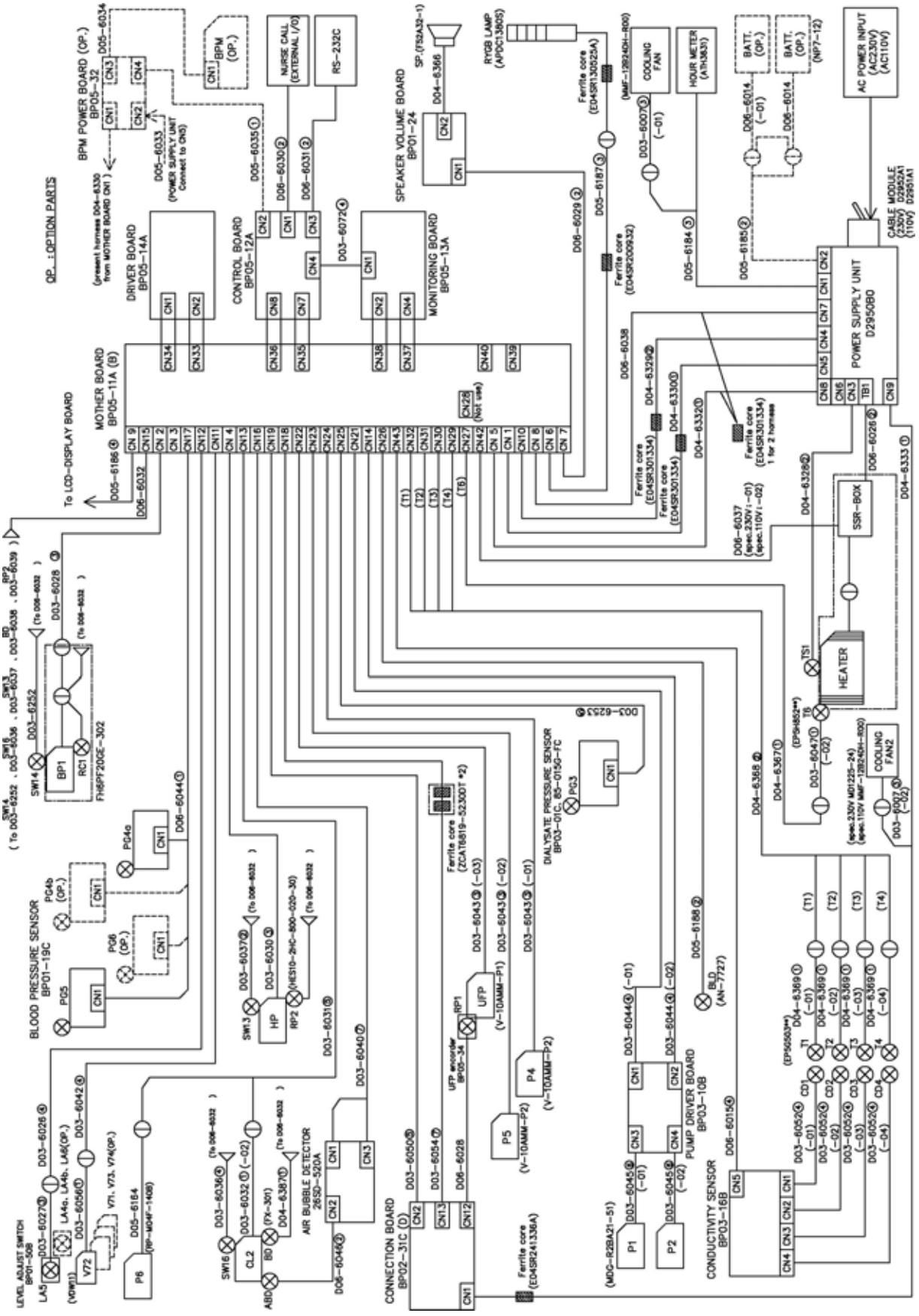
NOTE) This harness drawing is applicable the models with serial No. 04A0208 - 06A00** or - 06B00**.



11.5.3. Machine type 3

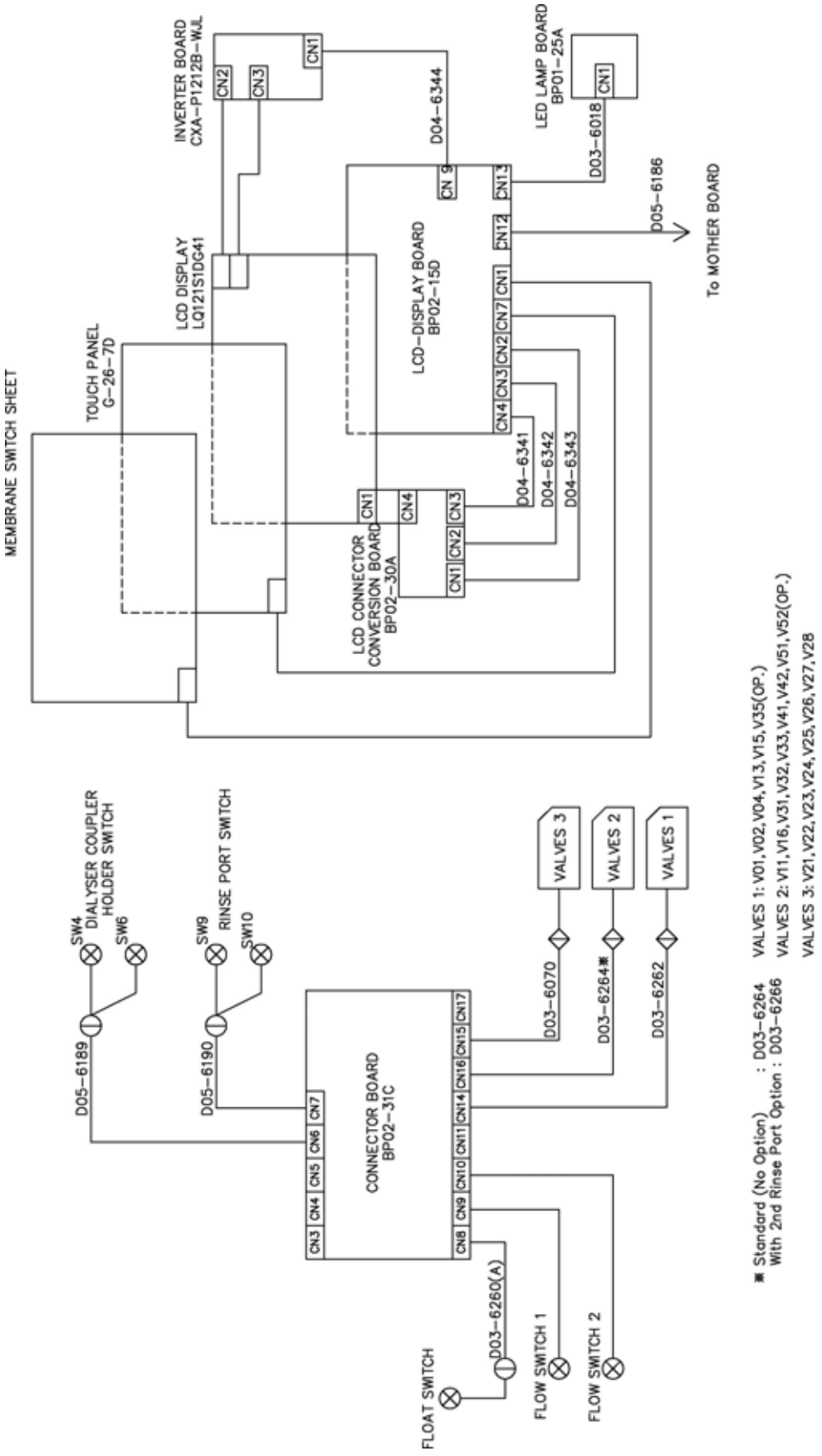
11.5.3.1 Power supply section

NOTE) This harness drawing is applicable the models with serial No. equal or after 06C00** or 06D00**.



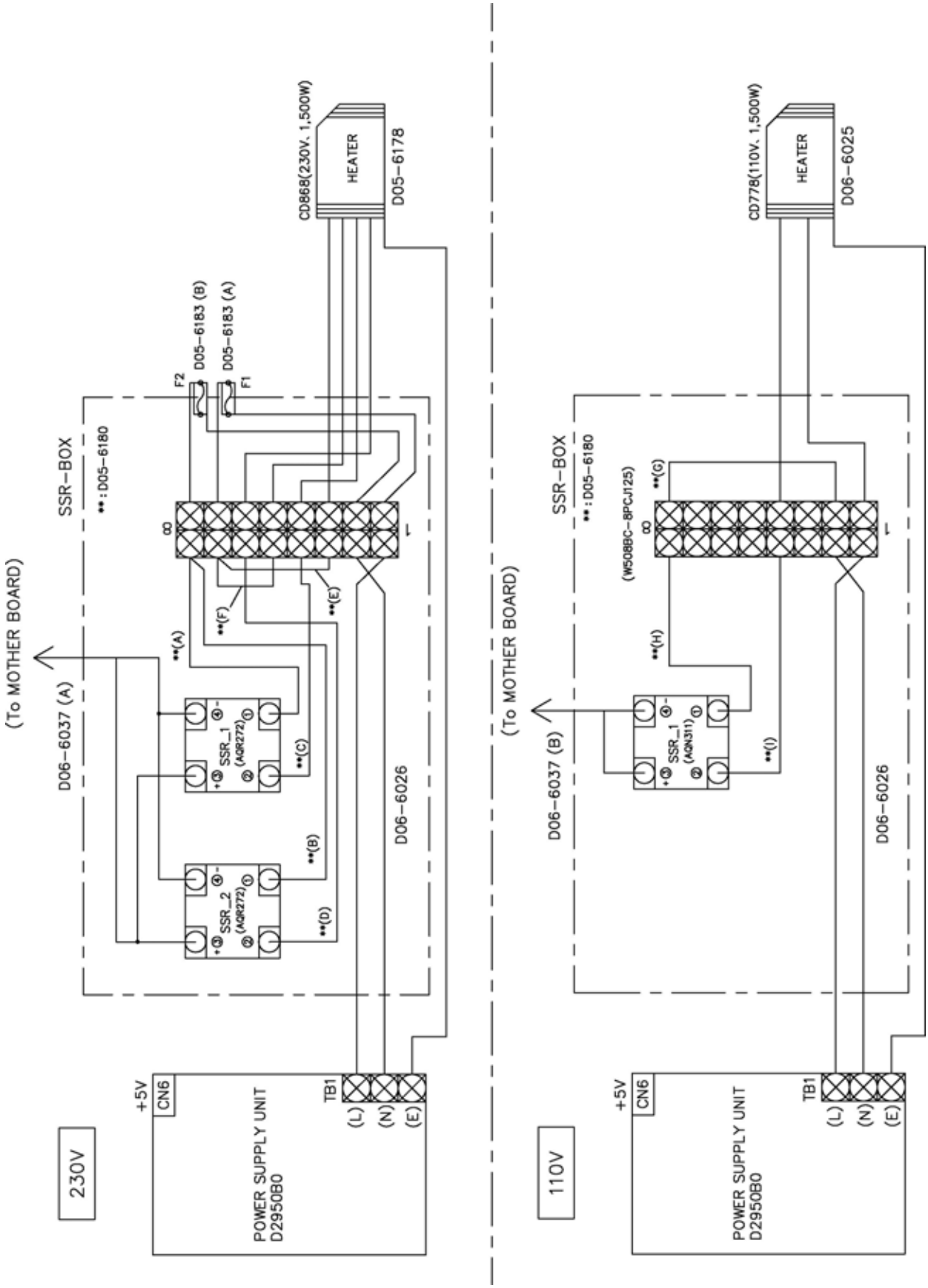
11.5.3.2 Dialysate line section and around operation panel

NOTE) This harness drawing is applicable the models with serial No. equal or after 06C00** or 06D00**.



11.5.3.3 SSR-Box

NOTE) This harness drawing is applicable the models with serial No. equal or after 06C00** or 06D00**.

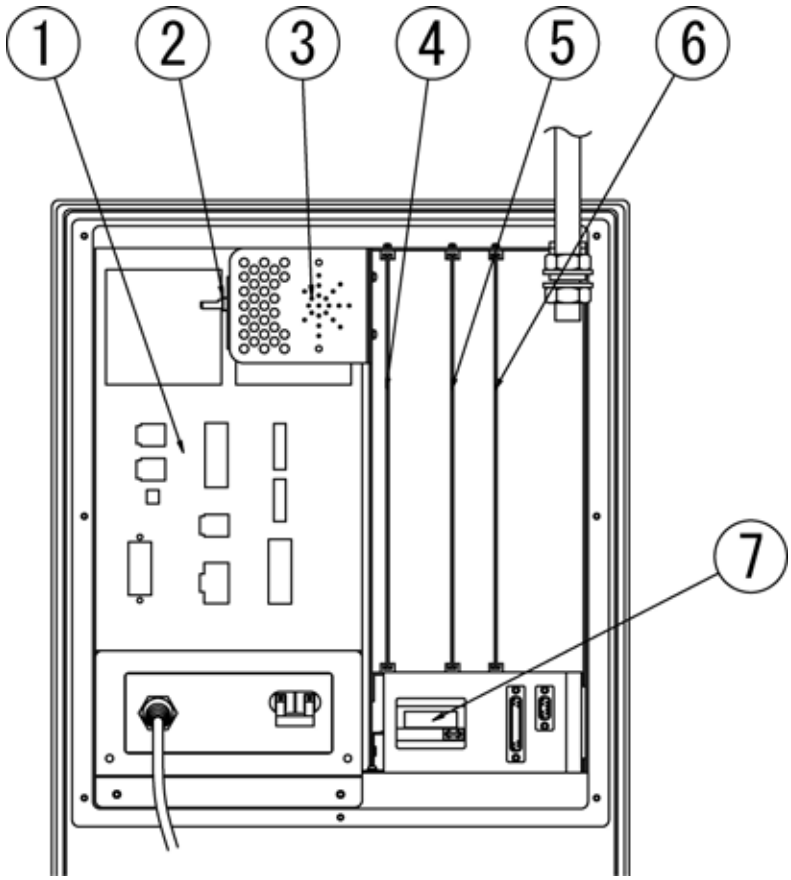


12 COMPOSITION OF ELECTRICAL EQUIPMENT

12.1. Electrical Parts at Rear Side of Machine

12.1.1. Rear side (Type1)

NOTE） This rear side electrical parts are equipped the models with equal or before serial No.04A0207E

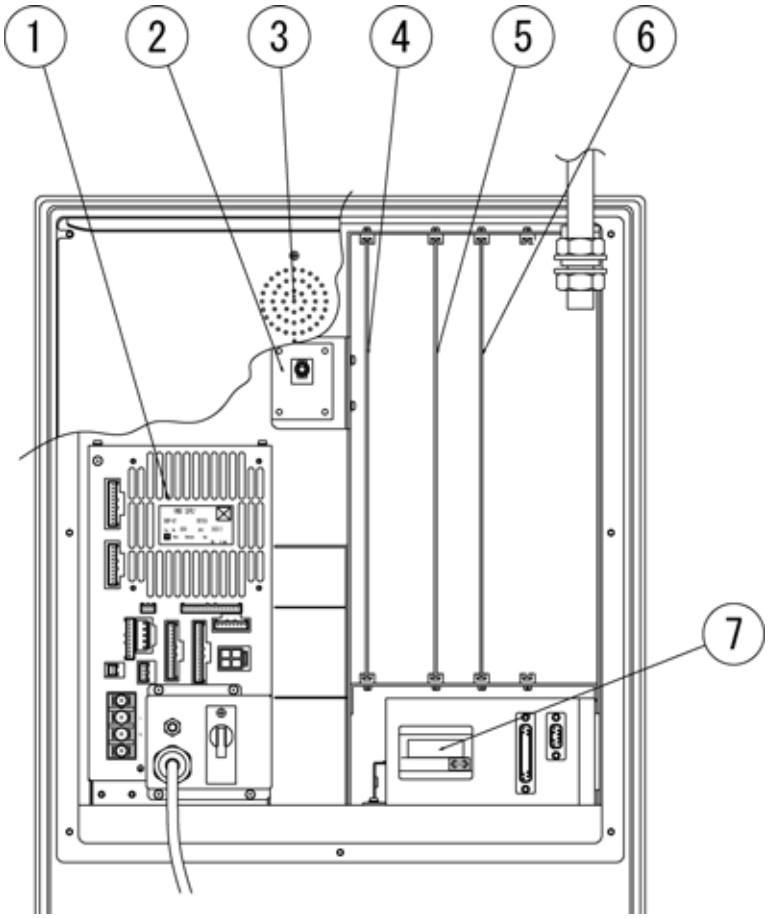


No.	Description	Standard /Material	Remarks
1	Power unit (Type 1)	BPS-02B	
2	Sound volume P.C. board	BP01-24	
3	Speaker	F52A32-1	
4	Driver P.C. board	BP02-18B	SLOT1
5	Control P.C. board	BP02-16B	SLOT2
6	Monitoring P.C. board (Type 1)	BP02-17B	SLOT3 （for Pt100） See NOTE
7	Hour meter	ATH3631	

NOTE） No.6 Monitoring P.C. board (BP02-17B) does not compatible with TYPE2(BP02-17C).

12.1.2. Rear side (Type2)

NOTE）This rear side electrical parts are equipped the models with equal or after serial No.04A0208E



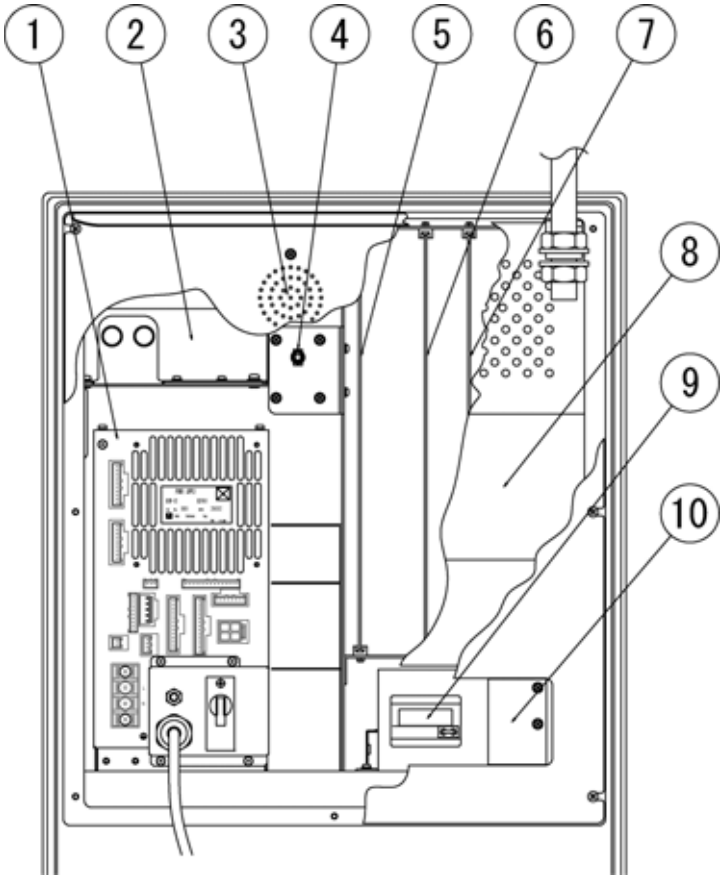
No.	Description	Standard /Material	Remarks
1	Power unit (Type 2)	D2950A	
2	Sound volume P.C. board	BP01-24	
3	Speaker	F52A32-1	
4	Driver P.C. board	BP02-18B	SLOT1
5	Control P.C. board	BP02-16B	SLOT2
6	Monitoring P.C. board	BP02-17C	SLOT3 （for thermistor） See NOTE.
7	Hour meter	ATH3631	

NOTE）No.6 Monitoring P.C. board (BP02-17C) does not compatible with TYPE1(BP02-17B).

12.1.3. Rear side (Type3)

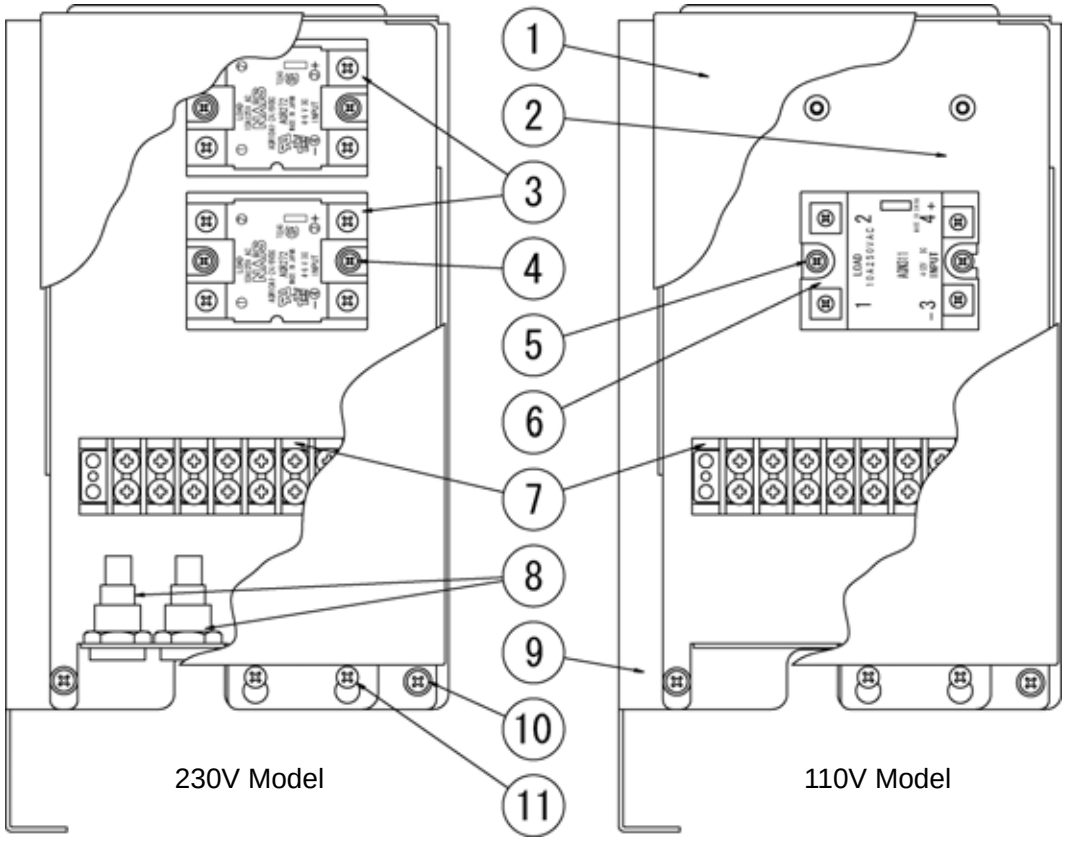
12.1.3.1 Rear side 1

NOTE）This rear side electrical parts are equipped the models with equal or after serial No.06C(or D)00**E



No.	Description	Standard /Material	Remarks
1	Power unit (Type 3)	D2950B	
2	SSR - Box		
3	Speaker	F52A32-1	
4	Sound volume P.C. board	BP01-24	
5	Driver P.C. board	BP05-14	SLOT1
6	Control P.C. board	BP05-12	SLOT2
7	Monitoring P.C. board	BP05-13	SLOT3 （for thermistor）
8	EMC Cover	SUS 430	
9	Hour meter	ATH3631	
10	Connector Cover	Stainless Steel	

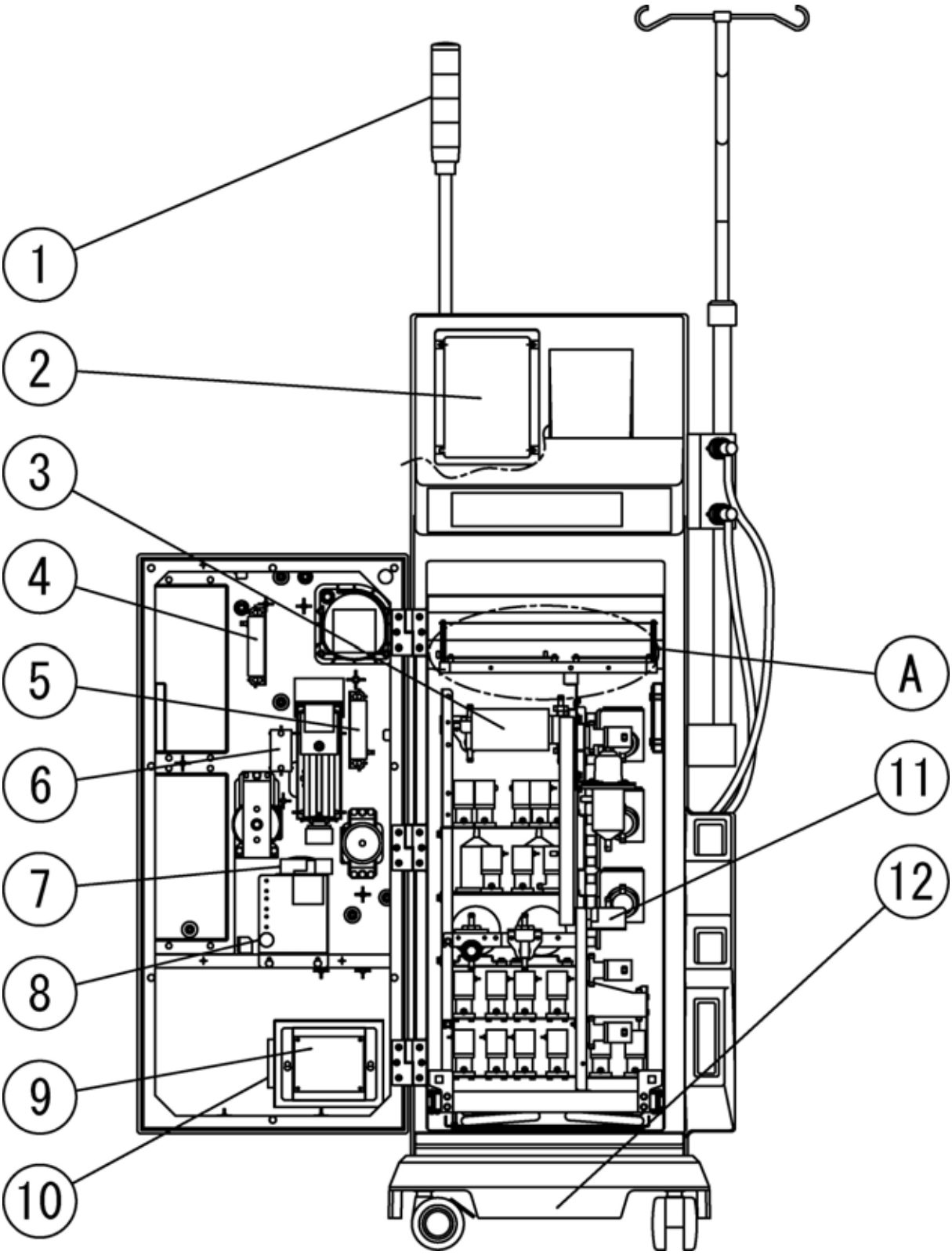
12.1.3.2 Rear side 2 (SSR Box)



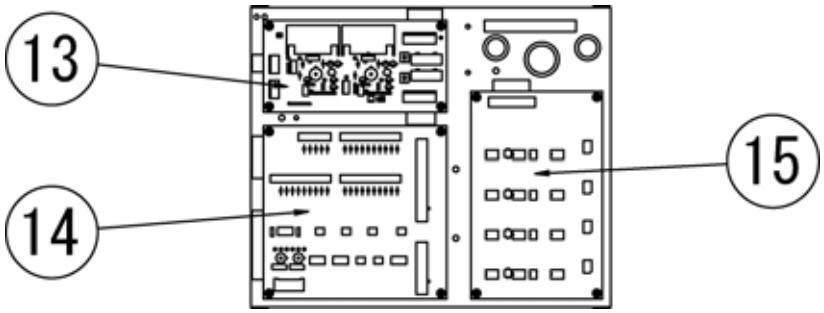
No.	Description	Standard /Material	Remarks
1	SSR Box Cover	Stainless Steel	
2	SSR Box Base	Stainless Steel	
3	SSR	AQR272	230V Model only
4	Cross recessed head pan screw		
5	Cross recessed head pan screw		
6	SSR	AQN311	110V Model only
7	Terminal Block	W508BC	
8	Fuse Holder	FH-B02	
9	SSR Box Bracket	Stainless Steel	
10	Cross recessed head pan screw		
11	Cross recessed head pan screw		

12.2. Electrical Parts at Inner Side of Front Door around the hydraulic.

The following is the electrical parts furnished around the hydraulic



Rear side



Front side

Top View A

No.	Description	Standard /Material	Remarks
1	4 color lamp	APDC1380S	
2	Mother P.C. board	BP02-14A	For TYPE 1 or 2 (See NOTE)
		BP05-11	For TYPE 3 (See NOTE)
3	Dialysate pressure sensor P.C. board	BP03-01A	
4	Blood pressure sensor P.C. board	BP01-19C	PG5(Venous side)
5	Blood pressure sensor P.C. board	BP01-19C	PG4a (Arterial side)
6	Level adjustment switch P.C. board	BP01-50B (White Keytop)	For TYPE 1 or 2 (See NOTE)
		BP01-50B (Gray Keytop)	For TYPE 3 (See NOTE)
7	Pump for level adjust	RP-M04F-140B	For drip chamber
8	Valve for level adjust	VDW11	For drip chamber
9	Air bubble detector P.C. board	26SD-520A	
10	Blood color sensor amplifier	FX-301	Compatible with FX-D1 type
11	Blood leak detector	AN7727	
12	Battery	NP7-12	

No.	Description	Standard /Material	Remarks
13	Pump driver P.C. board	BP03-10B	For P1 and P2.
14	Connector P.C. board	BP02-31B	For TYPE 1 or 2 (See NOTE)
		BP02-31C	For TYPE 3 (See NOTE)
15	Conductivity sensor P.C. board	BP03-16/16A	For TYPE 1 or 2 (See NOTE)
		BP03-16B	For TYPE 3 (See NOTE)

NOTE) DIAMAX have three Types. Please confirm the TYPE of Machine by the Tables of Chapter 11.

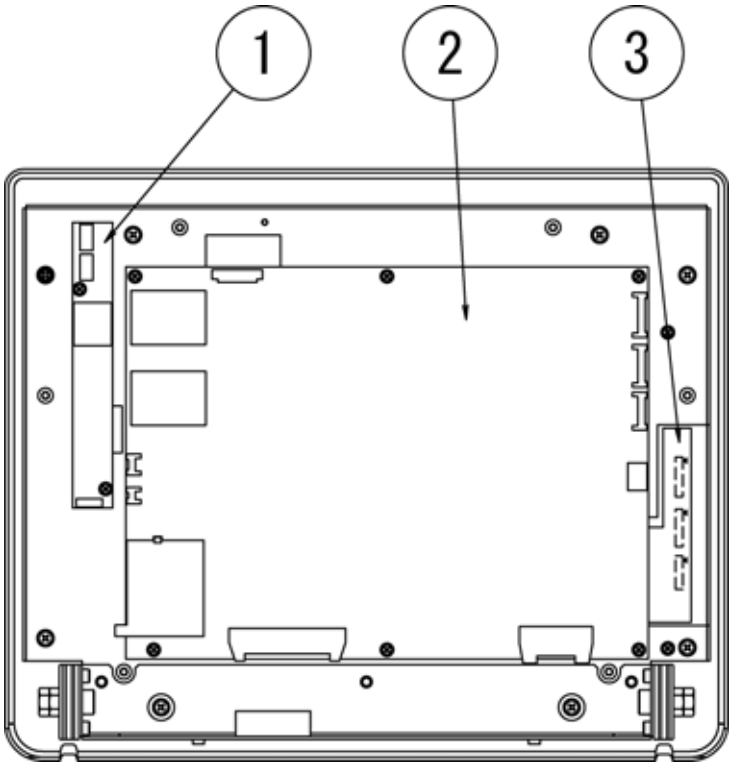
⚠CAUTION

LCD Display P.C. board, Control P.C. board, and Monitoring P.C. board are installed software.
The software versions of these boards need compatibility with each other. To replace these boards, confirm versions of these softwares. The machine cannot work if the boards that different software versions are installed to the machine.

12.3. Electrical parts at Operation Panel

The following is the electrical parts furnished at the operating sections.

Upper side

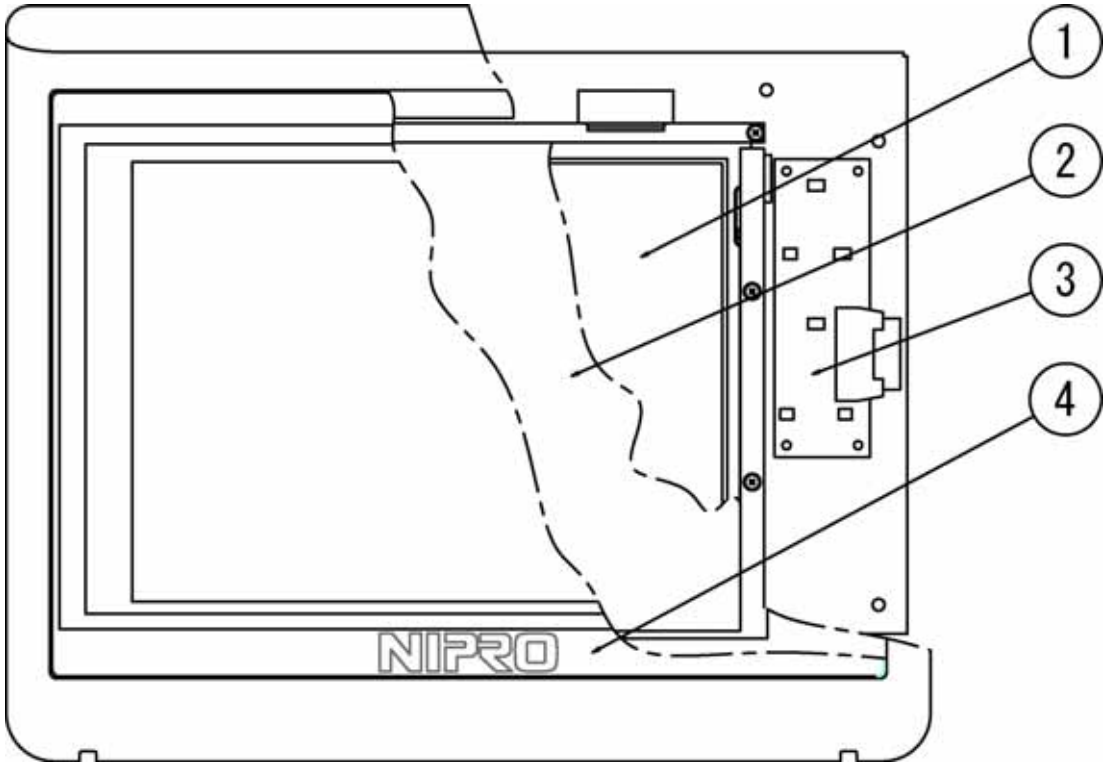


Lower side
(Connecting to the machine side)

No.	Description	Standard /Material	Remarks
1	Inverter P.C. board	CXA-P121DG41	
2	LCD display P.C. board	BP02-15C	For TYPE 1 or 2 (See NOTE)
		BP02-15D	For TYPE 3 (See NOTE)
3	LCD connector conversion P.C. board	BP02-30A	

NOTE) DIAMAX have three Types. Please confirm the TYPE of Machine by the Tables of Chapter 1.

12.4. Electrical parts at Front side of Operation Panel



No.	Description	Standard /Material	Remarks
1	LCD display	LQ121S1DG31	This parts is equipped the models with equal or before serial No.04A0207E
1	LCD display	LQ121S1DG41	This parts is equipped the models with equal or after serial No.04A0208E
2	Touch panel	G-26-7D	
3	LED Lamp P.C. board	BP01-25A	
4	Membrane key switch sheet	C03-3018	

NOTE）LCD display (LQ121S1DG31) was already stop the production.

13 Connection and replacement of P.C. board

13.1. The cautions on replacement / connection work of a P.C.Board

Please read the following directions, in order to ensure a worker's safety and to prevent damage to the machine by static electricity, before performing the procedure of this chapter.

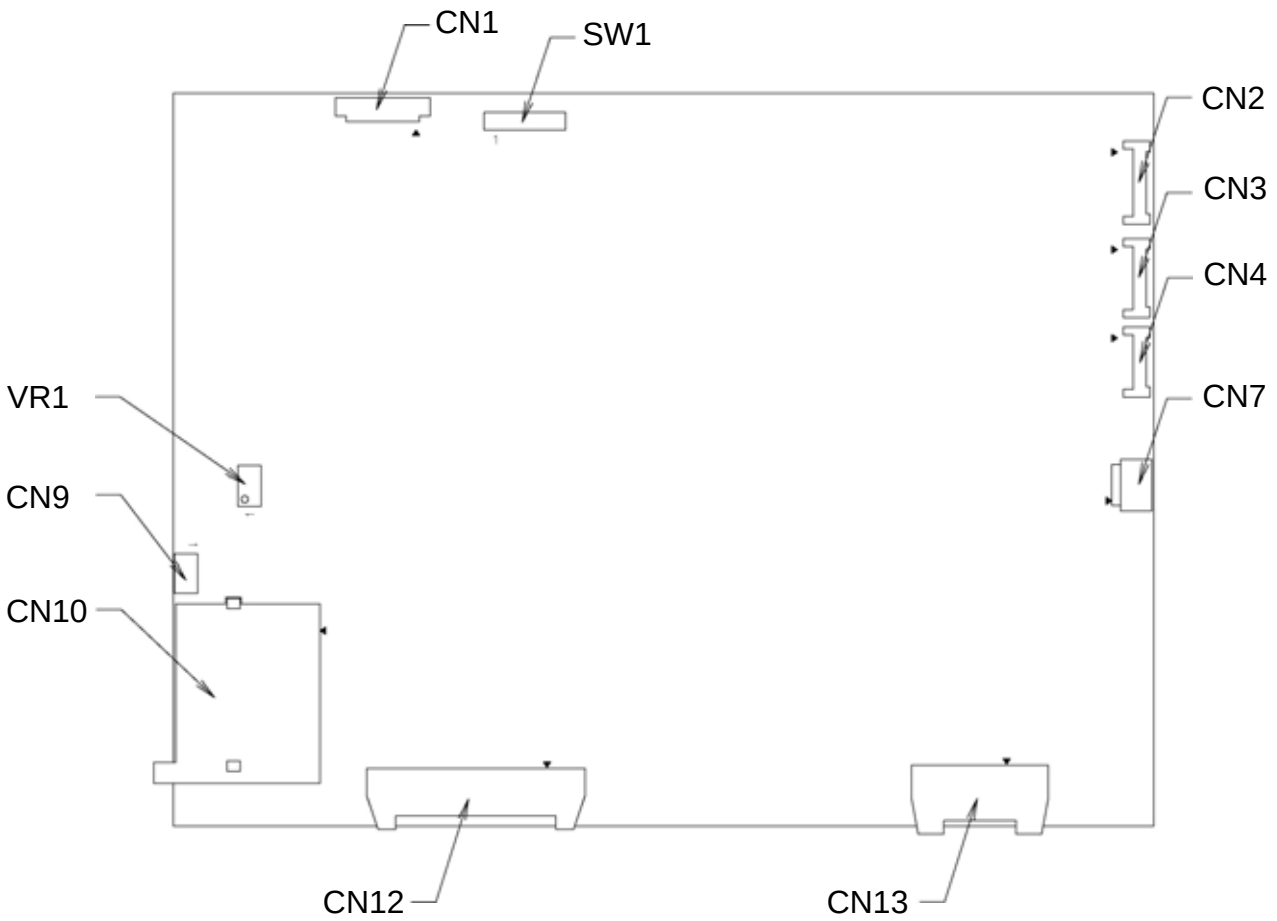
Cautions for ensuring a worker's safety and protecting a machine Please perform the next operation as turn before starting work.

1. The power switch of a machine is turned off.
2. The breaker of a Power supply unit is turned off.
3. In order to prevent damage to a P.C.Board, please work after turning off the breaker of a Power supply unit and waiting for 10 to 20 seconds.
4. It equips, when the wristband for static electricity prevention can be used, and a clip is stopped to a part for the metal department by which the surface inside a machine is not painted.
   When the wristband for static electricity prevention cannot be used, please touch a part for the metal department by which the surfaces, such as an inside of a machine or a Power supply unit, are not painted, and remove the static electricity of the body, before touching a P.C.Board.
   Also during work, the surface of the metal inside a machine, which is not painted, is touched periodically, and the static electricity, which has a bad influence on a P.C.Board, is missed.

13.2. Cautions of this chapter

- The variable resister on a P.C.Board is adjusted beforehand at the factory. Please do not adjust a variable resister, as long as there is no special description, since a highly precise measuring instrument is needed in order to adjust.
- When you exchange P.C.Boards, please check the Type of machine, or the type of P.C.Board in use, and exchange for a suitable P.C.Board.

13.3. LCD Display P.C. Board (BP02-15A, BP02-15B, BP02-15C, BP02-15D)



13.3.1. General

This is the P.C. board mounted inside the operating section and has the functions to display on the LCD panel, input to the touch panel, and read the CompactFlash card.

The machine of TYPE 1 and TYPE 2 uses BP02-15A, BP02-15B and BP02-15C.

The machine of TYPE 3 uses BP02-15D.

BP02-15D is compatible with the machine of TYPE 1 and TYPE 2.

13.3.2. Function of each part

- VR1: Variable resistor for LCD panel brightness control
- CN1: Membrane panel switch input connector
- CN2: Signal output connector for LCD panel (to LCD Connector Conversion P.C. Board - CN1)
- CN3: Signal output connector for LCD panel (to LCD Connector Conversion P.C. Board - CN2)
- CN4: Signal output connector for LCD panel (to LCD Connector Conversion P.C. Board - CN3)
- CN7: Touch panel input connector
- CN9: Power output connector for inverter P.C. board (to Inverter P.C. Board - CN1)
- CN10: CompactFlash card connector

- CN12: Connector for power input, I/O with other P.C. boards, and through signal (to Mother P.C. board - CN9)
- CN13: Operation panel LED lamp signal output connector (to LED Lamp P.C. Board - CN1)
- SW1: Dipswitch for function setting

  SW1-1: Program download mode switch (Download mode: ON)

  If this switch is set ON when the machine starts up, the machine falls into the mode to download a program from a CompactFlash card. In this mode, programs and bitmap data can be updated.

  SW1-2 to SW1-8: Do not change without special instruction.

13.3.3. Replacement

- Open the rear cover of the operation section and replace the P.C. board when the abnormality has occurred with this P.C. board.
- In order to disconnect the membrane panel switch cable of CN1, slide the CN1 lever horizontally and lift it obliquely. When connecting the cable, insert the cable to the depth and lean down the lever and slide it to the depth horizontally.
- Pull CN7 connector straight grabbing the rigid part (reinforcing plate) of the flexible cable at the touch panel. When connecting CN7 connector, insert it to the depth of the connector, grabbing the reinforcing plate of the flexible cable.
- As to CN12 and CN13, the cable connector comes off by opening the lever. To connect the cable connector, push in the connector to the depth and close the lever.
- To disconnect or connect other cables, push in or pull out the cable, with grabbing the connector.
- Set SW1 to the settings before replacing the P.C. board.
- Confirm that each connector is correctly connected before turning ON the power supply after the P.C. board is replaced.
- After turning ON the power supply, confirm that the lamp indication and LCD display are output, the touch panel is operative, and the buzzer sounds when operation is made.

13.3.4. Adjustment

No adjustment is required. If necessary, turn VR1 to adjust the brightness of the LCD panel. (Too much brightness setting would shorten the service life of the panel.)

13.3.5. Precautions

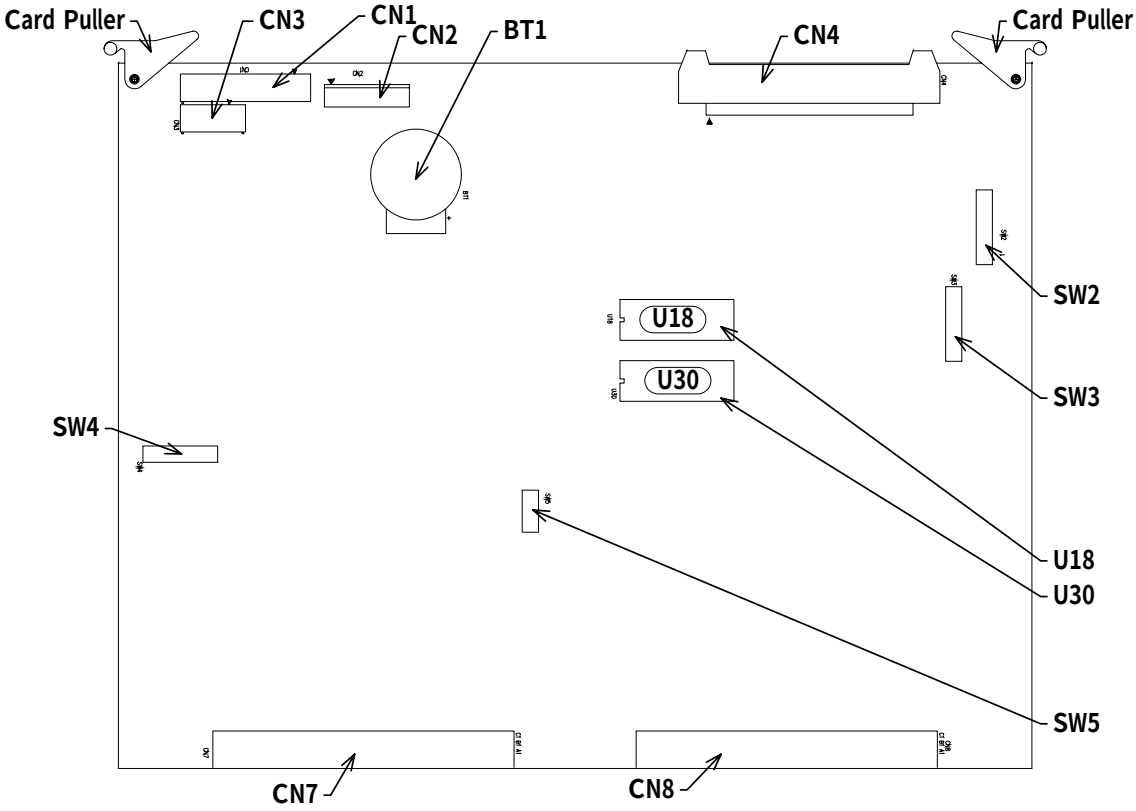
- Carefully handle the membrane panel cable connected to CN1 and the touch panel cable connected to CN7 since they are flexible cables that can be easily folded and damaged. Grab the reinforcing plate when inserting or pulling out these cables.
- Also, insert or pull out other cables with grabbing the cable connector. Pulling out or inserting a cable, grabbing the cable itself may break the wires inside.
- After setting SW 1, turn OFF the power supply once and restart the machine to make the new settings effective.
- Be sure to turn OFF the power supply when inserting a CompactFlash card to CN10. CN10 is not of the live-line insertion specification, hence the card may be broken if inserted when the power supply is ON.

- When there is a need to touch the live P.C. board, never touch the long and slender inverter P.C. board in the vicinity of CN9. There is a possibility of an electric shock since high voltage (1700 V) is impressed on it. (It is recommended to cover the P.C. board with isolating material.)
- The life of the backlight of the LCD panel is about 50000h.
- A P.C.Board number "BP02-15A", "BP02-15B", "BP02-15C", and "BP02-15D" are in the P.C.Board back.

⚠ CAUTION

LCD Display P.C. board, Control P.C. board, and Monitor P.C. Board are installed software. The software versions of these boards need compatibility with each other. To replace these boards, confirm versions of these softwares. The machine cannot work if the boards that different software versions are installed to the machine.

13.4. Control P.C. Board (BP02-16B, BP05-12A, BP05-12B): CPU1



13.4.1. General

This P.C. board controls various pumps, valves, and color lamps, measures temperatures, conductivities, pressures, air bubbles, blood leakage, rotating speed of pump, and rotating direction, manages the internal clock and various set values, and outputs alarms. This P.C. board is mounted in the mother P.C. board at SLOT2 inside the upper case of the machine.

The machine of TYPE 1 and TYPE 2 uses BP02-16B.

The machine of TYPE 3 uses BP05-12A or BP05-12B.

BP05-12A and BP05-12B has a compatibility with the machine of TYPE 1 and TYPE 2.

13.4.2. Function of each part

CN1: External I/O connector (to rear connector panel.)

CN2: Sphygmomanometer (manufactured by Omron Colin Co., Ltd.: Option) connector

CN3: Connector for external serial communication (to rear connector panel.)

CN4: Connector for monitoring (to Monitor P.C. Board - CN1)

CN7: Mother board connector lower block control line input (to Mother P.C. board - CN35)

CN8: Mother board connector upper block control line input (to Mother P.C. board - CN36)

BT1: Button type battery for backup of clock

U18: IC1 to hold set value

U30: IC2 to hold set value

SW2: Dipswitch for function setting [Do not change without special instruction.]

SW3-1: P.C. board type BP02-16B is set OFF.

P.C. board type BP05-12A and BP05-12B are set ON.

SW3-2: setup of HP minimum flow rate

OFF = 0.1 mL/h

ON = 1.0 mL/h

SW3-3 to SW3-8: Do not change without special instruction.

SW4: Dipswitch for function setting [Do not change without special instruction.]

SW5: Dipswitch for function setting [Do not change without special instruction.]

13.4.3. Replacement

- Open the rear cover of the upper section of the machine and replace this P.C. board when some trouble related with this P.C. board, such as the cases when the machine does not start up, the movement of a pump or a valve is abnormal, etc. has occurred
- To pull out the P.C. board, push up and down both the white card pullers at the top and bottom of the P.C. board. Then, the P.C. board will come off forward.
- For the usual replacement of the P.C. board, put ICs of U18 and U30 mounted on the old P.C. board (mounted on respective socket) onto the new P.C. board, taking caution not to mix up U18 and U30. By doing so, there is no need to set the set values again since both the ICs hold the specified set values.
- If set values are abnormal or the values return to original values when the machine is restarted even after the values are changed, the battery is included in the inside of a chip, and if this battery is running out, since a value is lost, exchange U18 and U30 for a new chip.

  In such a case, the set values must be manually set in the TECHNICIAN mode after starting the machine.
- If the clock is reset every time the machine is started, the button type battery for the backup of the clock has discharged and it must be replaced. (Button-type battery: CR2450) Service life of the battery is five years. (The service life may be shorter than this period when the battery set on the shipment of the machine from our factory is still used.) After replacing the battery and mounting the P.C. board to the machine, start up the machine and set the date and time by proceeding to OPTION→CLOCK SETTING in the TECHNICIAN mode.
- When inserting the P.C. board, set it to SLOT2 with its parts mounted surface faced to the right and push it along the guide rail groove. At first, lightly insert the P.C. board so that CN8 (upper connector) and CN7 (lower connector) are engaged with the connectors of the mother P.C. board, and then forcibly push the white card puller sections at the upper and lower sections so that the P.C. board is inserted to the depth.
- After replacement of the P.C. board, actually operate the machine and confirm there is no problem with the P.C. board.

13.4.4. Adjustment

No adjustment is required since it is already adjusted at our factory before the shipment of the machine.

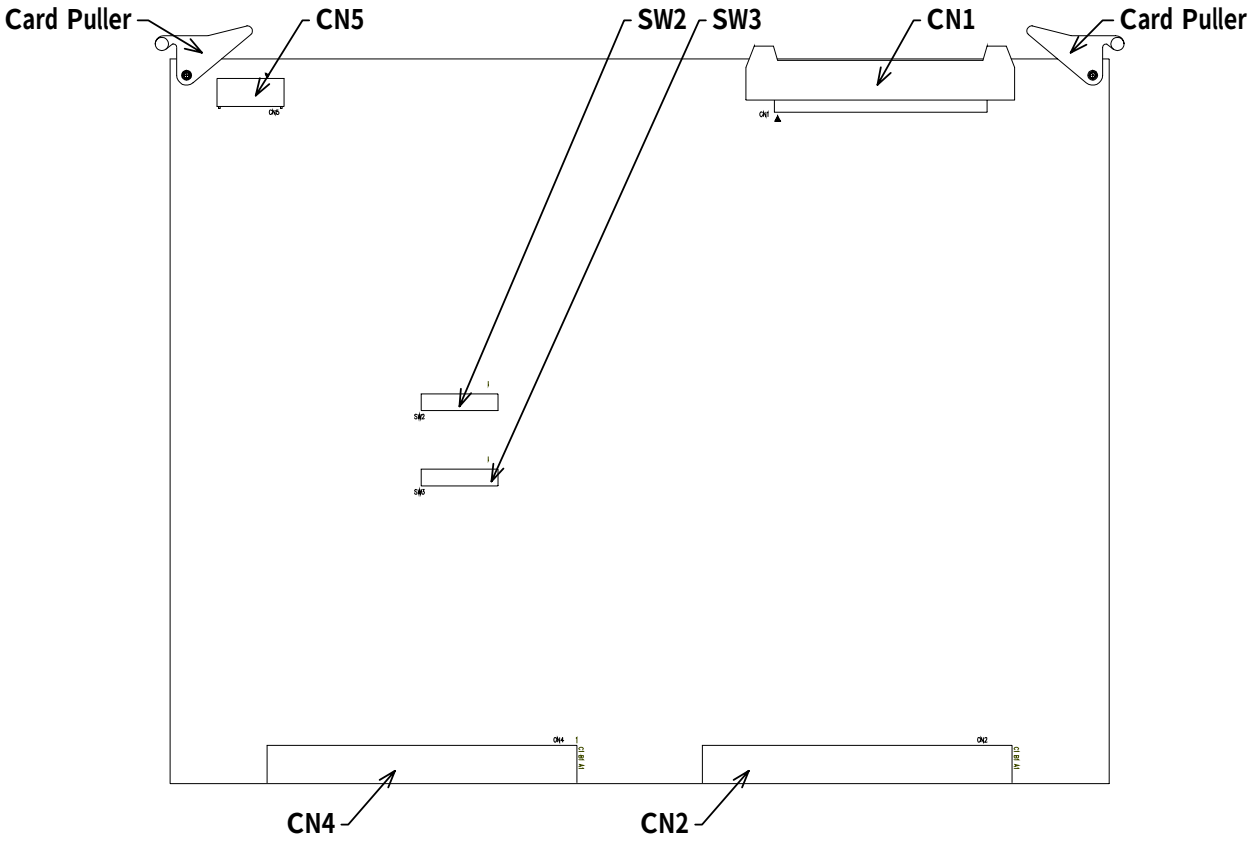
13.4.5. Precautions

- Be sure to insert the P.C. board to SLOT2 when inserting it. If inserted into a different slot, not only this P.C. board but other P.C. board may be damaged.
- Do not try to forcibly push the P.C. board if CN7 and CN8 are not properly engaged with the connectors of the mother P.C. board. Otherwise, the connectors will be damaged.
- Fully insert the P.C. board to the depth since incomplete insertion may cause a trouble.
- Since a button type battery (CR2450) is mounted for the backup of the clock, do not place the P.C. board on any electrically conductive item for the storage or replacement. If placed on such an item, the battery will be discharged, advancing the time of replacement or malfunctioning the clock.
- Do not touch any variable resistor.

⚠ CAUTION

LCD Display P.C. board, Control P.C. board, and Monitor P.C. Board are installed software. The software versions of these boards need compatibility with each other. To replace these boards, confirm versions of these softwares. The machine cannot work if the boards that different software versions are installed to the machine.

13.5. Monitor P.C. Board (BP02-17B, BP02-17C, BP05-13A, BP05-13B): CPU2



13.5.1. General

The Monitor P.C. Board monitors the conditions of the pulse outputs, shuts down the pulse outputs, monitors temperatures, conductivities, pressures, air bubbles, blood leak, rotating speed of pumps, rotating direction of pumps, and conditions of various switches. This P.C. board is inserted into SLOT3 of the mother P.C. board inside the upper case of the machine.

The machine of TYPE 1 uses BP02-17B.

The machine of TYPE 2 uses BP02-17C.

The machine of TYPE 3 uses BP05-13A or BP05-13B.

BP05-13A and BP05-13B has a compatibility with the machine of TYPE 2.

13.5.2. Function of each part

CN1: Connector for monitoring (to Control P.C. Board - CN4)

CN2: Mother board connector upper block control line input (to Mother P.C. board - CN38)

CN4: Mother board connector lower block control line input (to Mother P.C. board - CN37)

CN5: External serial communication connector

SW2: Dipswitch for function setting

SW2-1: P.C. board types BP02-17B and BP02-17C are set OFF.

P.C. board type BP05-13A and BP05-13B are set ON.

SW2-2 to SW2-8: Do not change without special instruction.

SW3: Dipswitch for function setting [Do not change without special instruction.]

13.5.3. Replacement

- Open the rear cover of the upper section of the machine and replace this P.C. board when some trouble related with this P.C. board, such as the case when the machine does not start up, etc. has occurred
- To pull out the P.C. board, push up and down both the white card pullers at the top and bottom of the P.C. board. Then, the P.C. board will come off forward.
- When inserting the P.C. board, set it to SLOT3 with its parts mounted surface faced to the right and push it along the guide rail groove. At first, lightly insert the P.C. board so that CN2 (upper connector) and CN4 (lower connector) are engaged with the connectors of the mother board P.C. board, and then forcibly push the white card puller sections at the upper and lower sections so that the P.C. board is inserted to the depth.
- After replacement of the P.C. board, actually operate the machine and confirm there is no problem.

13.5.4. Adjustment

No adjustment is required since it is already adjusted at our factory before the shipment of the machine.

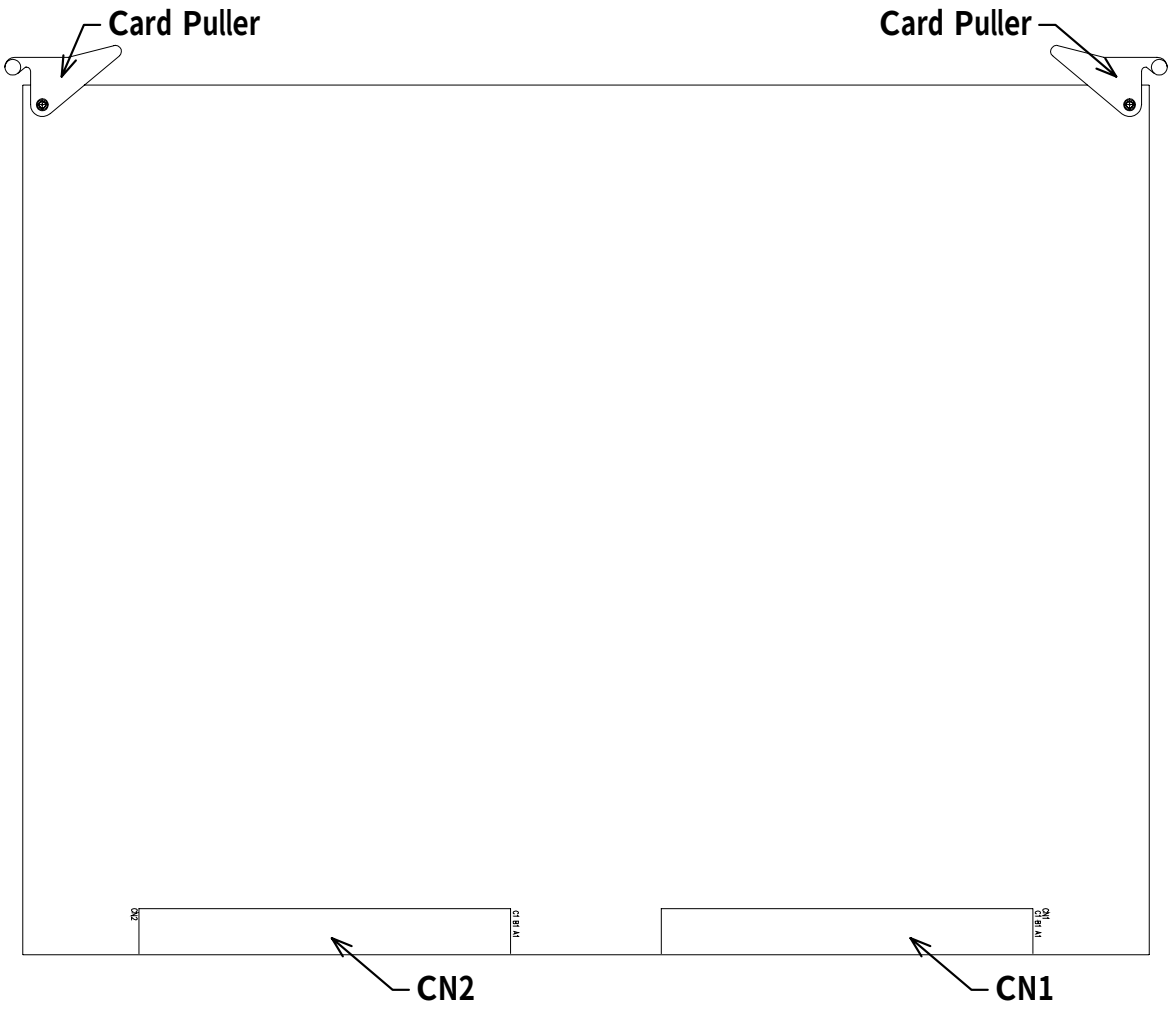
13.5.5. Precautions

- Be sure to insert the P.C. board to SLOT1 when inserting it. If inserted into a different slot, not only this P.C. board but other P.C. board may be damaged.
- Do not try to forcibly push the P.C. board if CN2 and CN4 are not properly engaged with the connectors of the mother P.C. board. Otherwise, the connectors will be damaged.
- Fully insert the P.C. board to the depth since incomplete insertion may cause a trouble.
- Do not touch any variable resistor.

CAUTION

LCD Display P.C. board, Control P.C. board, and Monitor P.C. Board are installed software. The software versions of these boards need compatibility with each other. To replace these boards, confirm versions of these softwares. The machine cannot work if the boards that different software versions are installed to the machine.

13.6. Driver P.C. Board (BP02-18B, BP05-14A): DRIVER



13.6.1. General

The driver P.C. board incorporates the drive circuits for A concentrate pump (P5), B concentrate pump (P4), UF pump (UFP), syringe pump (HP), and blood pumps (BP1, BP2) and also the condenser for outputting alarm at the time of blackout and is inserted into SLOT1 of the mother board P.C. board inside the upper case of the machine.

The machine of TYPE 1 and TYPE 2 uses BP02-18B.

The machine of TYPE 3 uses BP05-14A.

BP05-14A has a compatibility with the machine of TYPE 1 and TYPE 2.

13.6.2. Function of each part

CN1: Mother board P.C. board connector upper block – control line input (to Mother P.C. board - CN34)

CN2: Mother P.C. board connector upper block – drive line input (to Mother P.C. board - CN33)

13.6.3. Replacement

- Open the rear cover of the upper section of the machine and replace this P.C. board when some trouble related with this P.C. board, such as the case when a pump does not rotate, etc. has occurred.
- Turn OFF the power breaker and take measures against the static electricity when replacing the P.C. board.
- To pull out the P.C. board, push up and down both the white card pullers at the top and bottom of the P.C. board. Then, the P.C. board will come off forward.
- Since electric double-layer capacitors (Super Capacitor) is mounted to output alarm in case of blackout, do not contact with a conductor and other P.C. boards when pulling out or inserting this P.C. board or placing it on the table temporarily. Besides, discharge the residual electricity in the condenser when only the P.C. board is stored. (For example, discharge the electricity by short-circuiting both ends of a condenser, output an alarm by shutting down the power supply with the breaker, etc.)
- When inserting the P.C. board, set it to SLOT1 with its parts mounted surface faced to the right and push it along the guide rail groove. At first, lightly insert the P.C. board so that CN1 and CN2 are engaged with the connectors of the mother P.C. board, and then push the white card puller sections at the upper and lower sections strongly so that the P.C. board is inserted to the depth.
- After replacement of the P.C. board, actually operate the machine and confirm there is no problem.

13.6.4. Adjustment

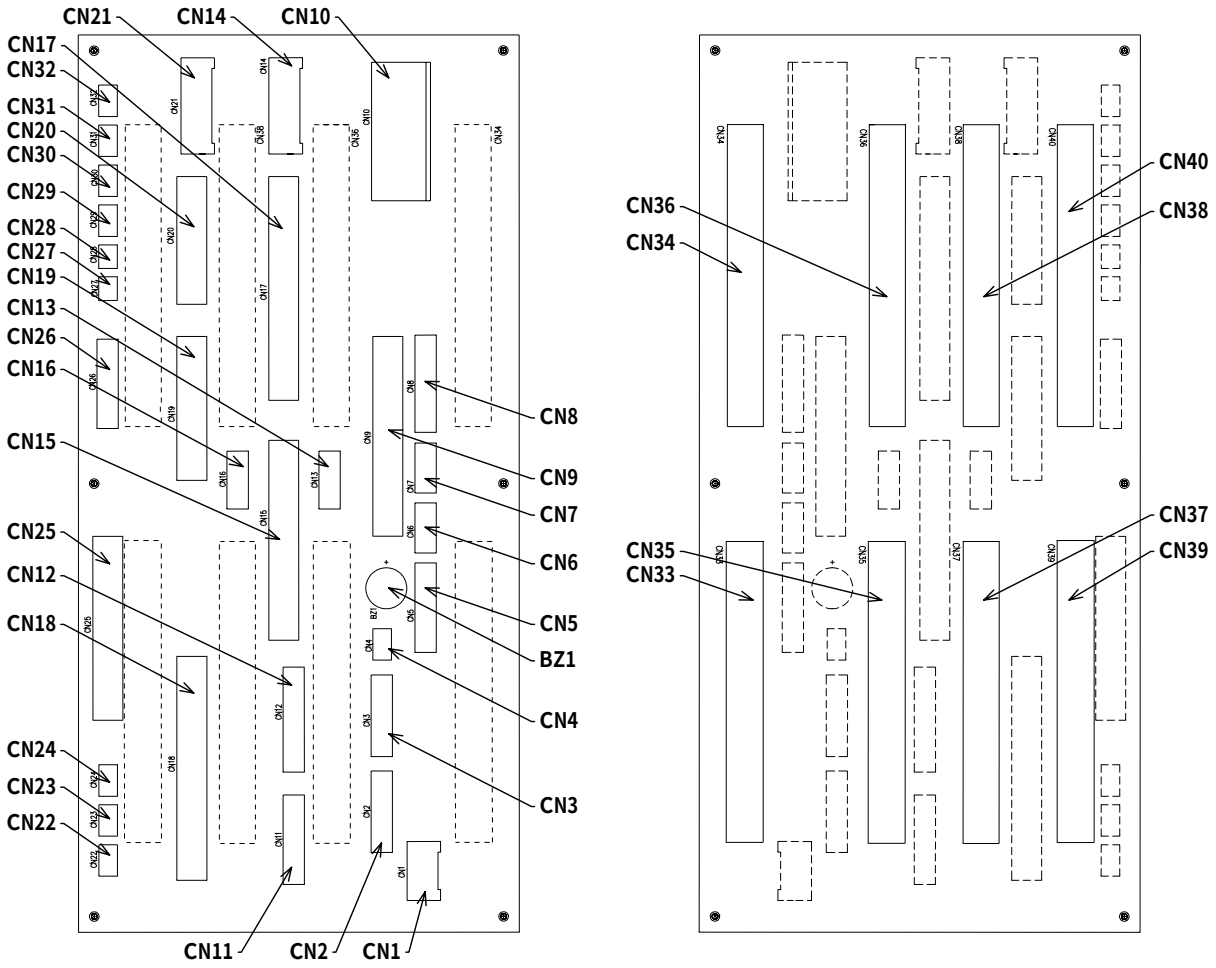
No adjustment is required since it is already adjusted at our factory before the shipment of the machine.

13.6.5. Precautions

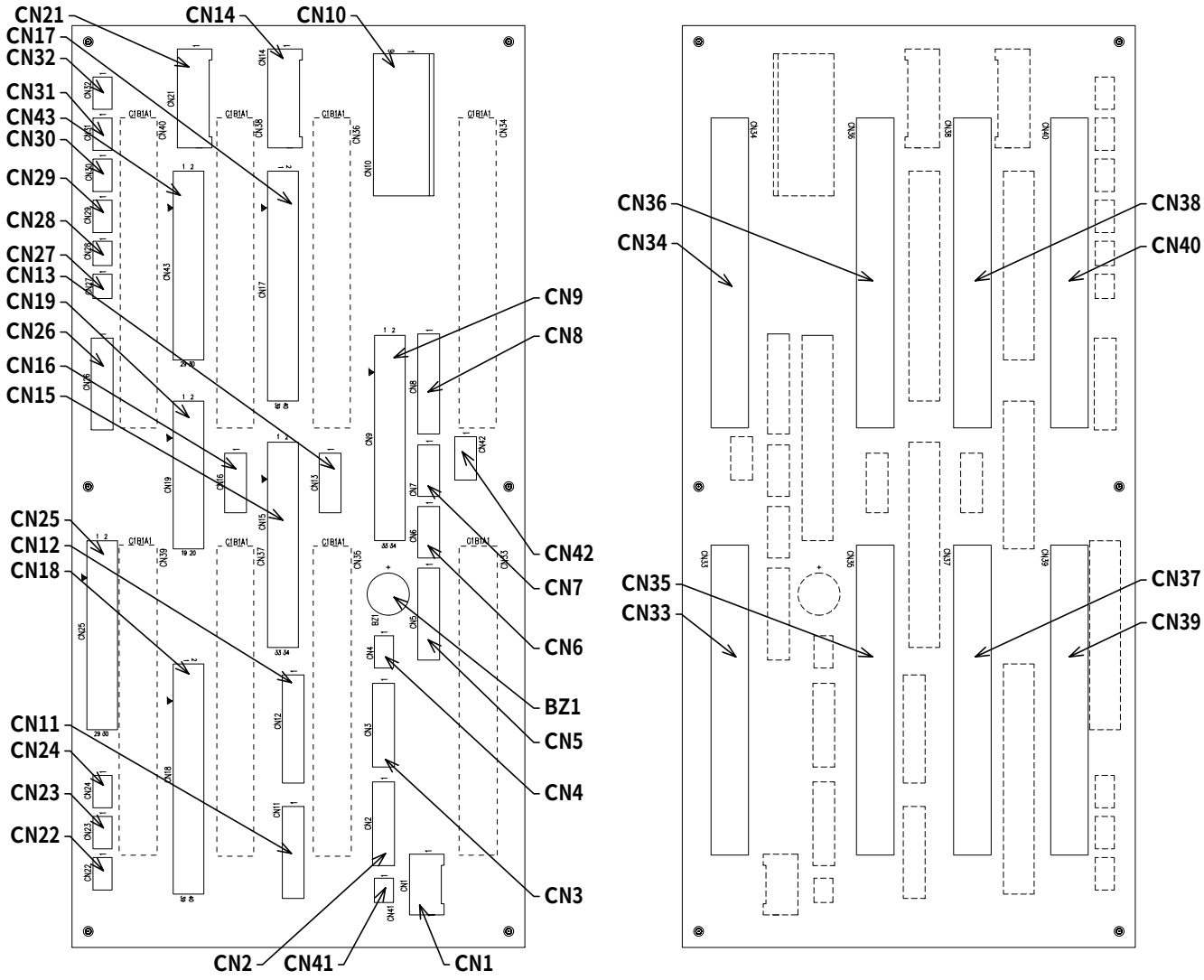
- Be sure to insert this P.C. board to SLOT1 when inserting it. If inserted into a different slot, not only this P.C. board but other P.C. board may be damaged.
- Do not try to forcibly push the P.C. board if CN1 and CN2 are not properly engaged with the connectors on the mother P.C. board. Otherwise, the connectors will be damaged.
- Fully insert the P.C. board to the depth since incomplete insertion may cause a trouble.
- Do not touch any variable resistor.

13.7. Mother P.C. board (BP02-14A, BP05-11A)

13.7.1. Part allocation of BP02-14A



13.7.2. Part allocation of BP05-11A



FRONT BACK

13.7.3. General

The control P.C. board, the Monitor P.C. Board, and the driver P.C. board are inserted into this mother P.C. board and this P.C. board relays and branches the signals of various sensors, pumps, valves, etc. and supplies power to each P.C. board. The mother P.C. board is positioned at the depth inside the upper case of the machine.

The machine of TYPE 1 and TYPE 2 uses BP02-14A.

The machine of TYPE 3 uses BP05-11A.

13.7.4. Function of each part

BZ1: Buzzer activated when key-in operation is made

CN1: +24V power input (24V1) connector for pumps and valves (from power supply unit CN4)

CN2: Blood pump BP1 output connector (to BP1)

CN3: Blood pump BP2 output connector (to BP2)

CN4: Syringe pump HP output connector (to HP)
CN5: Power supply control signal input connector (from power supply unit CN8)
CN6: Color lamps output connector (to color lamps)
CN7: Buzzer output connector (to Sound Volume P.C. board - CN1)
CN8: Power supply control signal output connector (from power supply unit CN12)
CN9: LCD display P.C. board I/O connector (to LCD Display P.C. Board - CN12)
CN10: Power supply input (+12V, ±15V, +24V2, +24V3) connector (from power supply unit CN4)
CN11: Valve signal output connector (to V71-V74)
CN12: Level adjustment switch input connector (from Level Adjustment Switch P.C.Board -CN1: 4 P.C. boards at maximum)
CN13: Clamp (CL1, CL2) and pump (P6) output connector (to CL1, CL2, P6)
CN14: Pump (P2) drive control output connector (to Pump Driver P.C.Board - CN2)
CN15: Switch, blood leak detector, and rotation sensor signal input connector (from SW12-19, BD, RP2, RC1, RC2)
CN16: Air bubble detector (ABD) analog input, control, and power supply output connector (from Air Bubble Detector P.C.Board – CN1/JP1 and CN3/JP3)
CN17: Blood pressure sensor (PG4-PG6) analog input and signal power supply output connector (from Blood Pressure Sensor P.C.Board - CN1)
CN18: Valve (V01-V64) signal output connector (to Connector P.C.Board - CN13)
CN19: Switch (SW1-11, FW, FS1-3) and rotation sensor (RP1) signal input connector (from Connector P.C.Board - CN2)
CN20: Conductivity sensor (CD1-CD4) analog input and signal power supply output connector (from Conductivity Sensor P.C.Board - CN5) [BP02-14A only]
CN21: Pump (P1) drive control output connector (to Pump Driver P.C.Board - CN1)
CN22: Pump (UFP) drive output connector (to UFP)
CN23: Pump (P5) drive switch output connector (to P5)
CN24: Pump (P4) drive switch output connector (to P4)
CN25: Dialysate pressure sensor (PG1-3) analog input and signal power supply output connector (from Dialysate Pressure Sensor P.C.Board - CN2)
CN26: Blood leak detector (BLD) analog input, control, and power supply output connector (from blood leak detector)
CN27: Temperature sensor (T6) input connector (from T6)
CN28: Temperature sensor (T5) input connector (from T5)
CN29: Temperature sensor (T4) input connector (from T4)
CN30: Temperature sensor (T3) input connector (from T3)
CN31: Temperature sensor (T2) input connector (from T2)
CN32: Temperature sensor (T1) input connector (from T1)
CN33: Driver P.C. board I/O connector lower block SLOT1 (to Driver P.C.Board - CN2)
CN34: Driver P.C. board I/O connector upper block SLOT1 (to Driver P.C.Board - CN1)
CN35: Control P.C. board I/O connector lower block SLOT2 (to Control P.C.Board - CN7)
CN36: Control P.C. board I/O connector upper block SLOT2 (to Control P.C.Board - CN8)
CN37: Monitor P.C. Board I/O connector lower block SLOT3 (to Monitor P.C. Board - CN4)
CN38: Monitor P.C. Board I/O connector upper block SLOT3 (to Monitor P.C. Board - CN2)
CN39: Extension P.C. board I/O connector lower block SLOT4
CN40: Extension P.C. board I/O connector upper block SLOT4

CN41: BPM power supply output [BP05-11A only]

CN42: Heater control signal output connector (to SSR-BOX) [BP05-11A only]

CN43: Conductivity sensor (CD1-CD4), analog input and signal power supply output connector (from Conductivity Sensor P.C.Board - CN5) [BP05-11A only]

13.7.5. Replacement

- Remove the front panel at the upper case on the rear side of the operating section and pull out all the harnesses connected to the mother P.C. board. After that, remove the rear cover at the upper case, and pull out the driver P.C. board, the control P.C. board, the Monitor P.C. Board, and the extension P.C. board. Since these P.C. boards are fixed on the steel plate with six screws from the pushing side of the P.C. boards, unscrew these screws and remove the mother P.C. board.
- When mounting the P.C. boards, take caution not to mix up the top and bottom and also the front and rear. Besides, correctly wire the cables.
- After replacement of the P.C. board, actually operate the machine and confirm there is no problem.

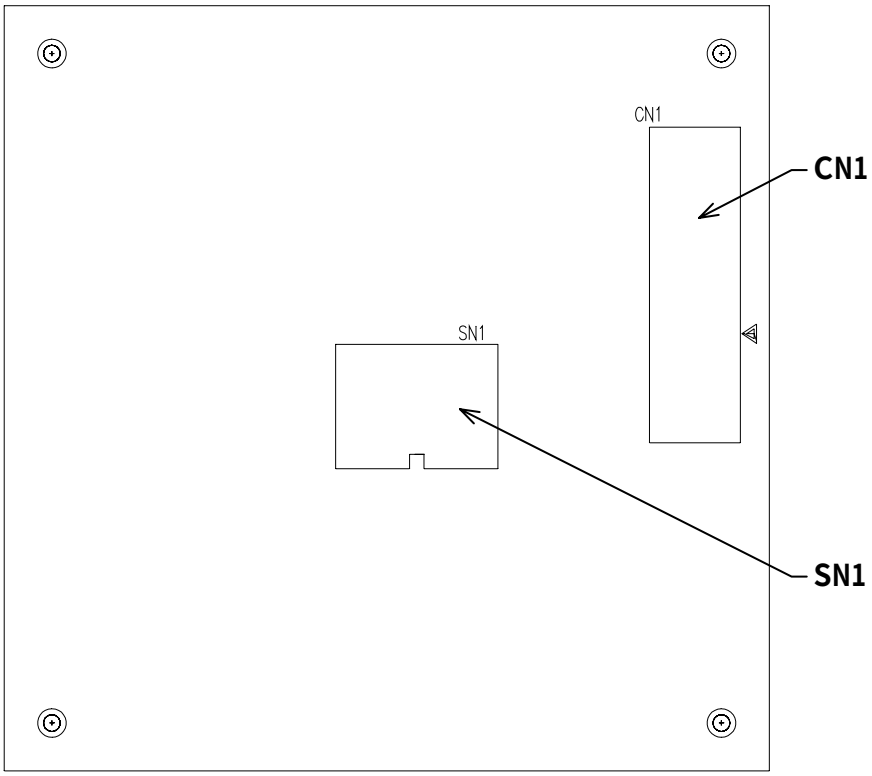
13.7.6. Adjustment

No adjustment is required.

13.7.7. Precautions

- When inserting the driver P.C. board, the control P.C. board, and the Monitor P.C. Board, be sure to insert them to the correct positions. Otherwise, the P.C. boards will be damaged.
- Take sufficient caution when handling the harness. Hold the connector housing when inserting or pulling out the harness.

13.8. Blood Pressure Sensor P.C. Board (BP01-19B, BP01-19C)



13.8.1. General

The blood pressure sensor P.C. board is mounted as the metal unit at the rear side of the front door and outputs the analog signal in proportion to the pressure in the bloodline measured through the diaphragm.

The machine of TYPE 1 and TYPE 2 uses BP01-19B.

The machine of TYPE 3 uses BP01-19C.

BP01-19C has a compatibility with the machine of TYPE 1 and TYPE 2.

13.8.2. Function of each part

CN1: Blood pressure analog output and test input connector (to Mother P.C. board - CN17)

SN1: Pressure sensor element

13.8.3. Replacement

- In order to replace this P.C. board, remove it from the case of the machine as the sheet metal unit. Besides, hold the connector housing when connecting or disconnecting the cable. Also, make sure the connector direction when connecting the cable.

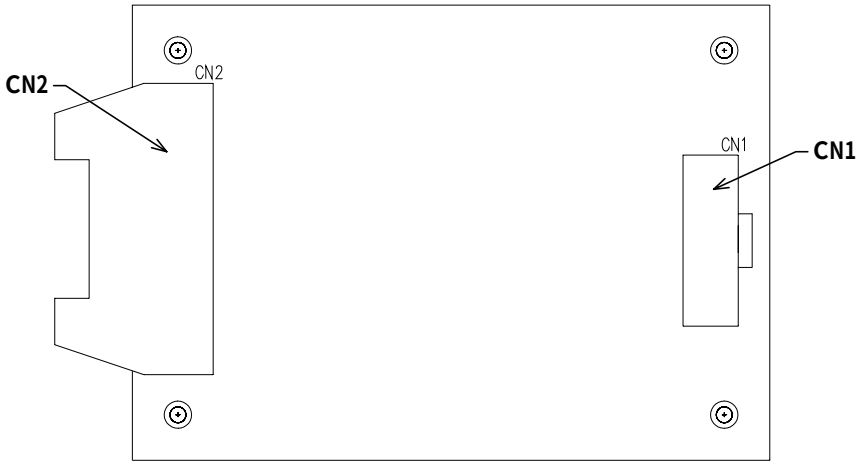
13.8.4. Adjustment

No adjustment is required since it is already adjusted at our factory before the shipment of the machine.

13.8.5. Precautions

- Note that the tube connected with the pressure sensor comes off easily.
- Do not give a mechanical shock to the pressure sensor element. (The element will be damaged.)
- Do not touch any variable resistor.
- P.C.Board number is in the P.C.Board back.

13.9. Dialysate Pressure Sensor P.C. Board (BP03-01A, BP03-01B, BP03-01C)



13.9.1. General

This is the P.C. board that directly measures the pressure of the dialysate line and outputs the analog output in proportion to the pressure. The P.C. board is mounted as a steal metal unit right below the mounting position of the P.C. board (connector P.C. board, etc.) above the dialysate line unit.

The machine of TYPE 1 and TYPE 2 uses BP03-01A or BP03-01B.

The machine of TYPE 3 uses BP03-01C.

BP03-01C has a compatibility with the machine of TYPE 1 and TYPE 2.

13.9.2. Function of each part

CN1: Dialysate pressure sensor element connector

CN2: Hydraulic pressure analog output and test input connector (to Mother P.C. board - CN25)

13.9.3. Replacement

- This P.C. board must be replaced with the dialysate pressure sensor element as a set. For the replacement, open the front door of the lower case and draw out the dialysate line unit, disconnect the tube connected to the dialysate pressure sensor element, and then remove the cover of the dialysate pressure sensor unit and remove the cable connected to CN2. Then, remove the P.C. board together with the dialysate pressure sensor unit. Reassemble them after replacing the P.C. board and the dialysate pressure sensor element.
- After replacement of the P.C. board, actually operate the machine and confirm there is no problem with the P.C. board.

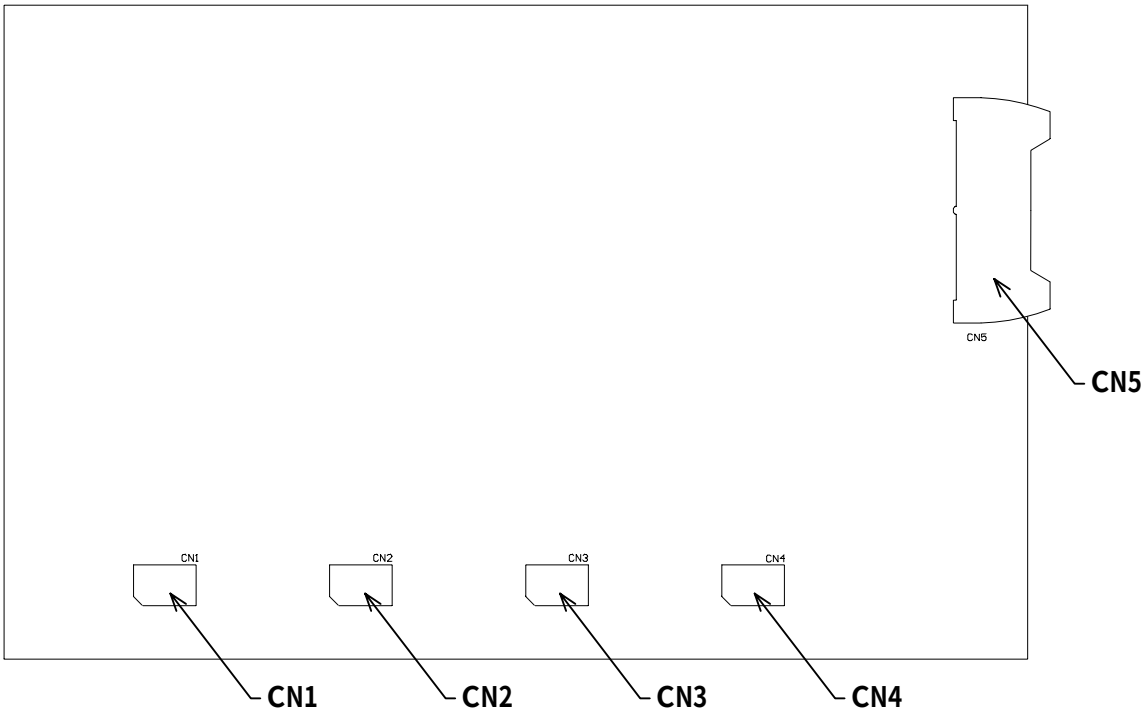
13.9.4. Adjustment

No adjustment is required since it is already adjusted at our factory before the shipment of the machine.

13.9.5. Precautions

- Note that CN1 for connecting the dialysate pressure sensor element easily comes off.
- When disconnecting the tube, block the tube with a clamp so as not to splash the residual dialysate inside the tube. Besides, prevent dialysate from splashing with a rag since it also remains inside (the resin of) the dialysate pressure sensor element. Especially, take caution not to splash dialysate to the electrical equipment, and if splashed on it, immediately wipe it off.
- Do not touch any variable resistor.
- P.C.Board number is in the P.C.Board back.

13.10. Conductivity Sensor P.C. Board (BP03-16A, BP03-16B, BP03-16C)



13.10.1. General

The conductivity sensor P.C. board is mounted at the top of the dialysate line unit inside the lower case of the machine and outputs the analog signal in proportion to the conductivity of the dialysate line, the conductivity cell connected to it.

The machine of TYPE 1 and TYPE 2 uses BP03-16A or BP03-16B.

The machine of TYPE 3 uses BP03-16C.

BP03-16C has a compatibility with the machine of TYPE 1 and TYPE 2.

13.10.2. Function of each part

CN1: Conductivity cell connector (to conductivity cell CD1)

CN2: Conductivity cell connector (to conductivity cell CD2)

CN3: Conductivity cell connector (to conductivity cell CD3)

CN4: Conductivity cell connector (to conductivity cell CD4)

CN5: Conductivity analog output and test signal input connector (to Mother P.C. board – CN20 at BP03-16A and BP03-16B, to Mother P.C. board – CN43 at BP03-16C)

13.10.3. Replacement

- To replace the P.C. board, open the front door of the lower case and draw out the dialysate line unit and then remove its top plate. Then, pull out the cables and remove the screws.
- Be sure to connect the cables correctly at the replacement. Also, actually operate the machine and confirm that there is no problem with the P.C. board. After the replacement of the P.C. board
- Take sufficient caution when inserting or pulling out the cables, always grabbing their connector

housing.

- Take care not to drop the removed screw to other parts.
- After replacement of the P.C. board, actually operate the machine and confirm there is no problem with the P.C. board.

13.10.4. Adjustment

No adjustment is required since it is already adjusted at our factory before the shipment of the machine.

13.10.5. Precautions

- Take sufficient caution when handling the connection cables.
- Also, take caution not to splash dialysate to other parts during the maintenance of the dialysate line.
- Do not touch any variable resistor.

13.11. Air Bubble Detector P.C. Board (23SD543, 26SD520A)

13.11.1. General

The air bubble detector P.C. board is mounted with cover at the lower part on the rear side of the front door and outputs the analog signal in proportion to the size of the air bubbles inside the bloodline, with the ultrasonic sensor element connected to it.

23SD543 and 26SD520A are the same P.C.Board functionally.

13.11.2. Function of each part

CN1/JP1: Power supply input connector (to Mother P.C. board - CN16)

CN2/JP2: Ultrasonic sensor element connector (to ultrasonic sensor element)

CN3/JP3: Analog signal output and test signal input (to Mother P.C. board - CN16)

13.11.3. Replacement

- When replacing this P.C. board, open the front door and remove the cover. Also, grab the connector housing when disconnecting the cables.
- After replacement of the P.C. board, actually operate the machine and confirm there is no problem with the P.C. board.

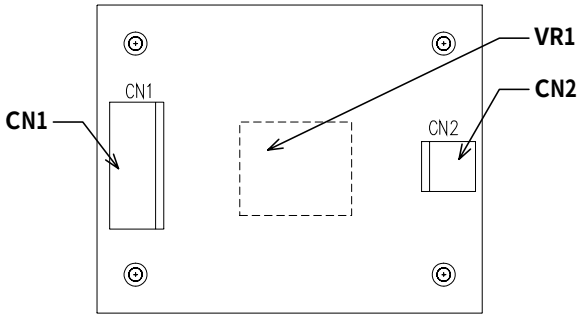
13.11.4. Adjustment

No adjustment is required since it is already adjusted at our factory before the shipment of the machine.

13.11.5. Precautions

- Do not touch any variable resistor.

13.12. Sound Volume P.C. Board (BP01-24)



13.12.1. General

The sound Volume P.C. board is mounted with the buzzer to the buzzer fixing bracket of the upper case and incorporates the variable resistor (VR) to adjust the volume of the alarm and melody sounds.

13.12.2. Function of each part

VR1: Variable resistor for volume adjustment
CN1: Buzzer connector
CN2: Aural signal input connector (to Mother P.C. board - CN7)

13.12.3. Replacement

- Remove the fixing bracket and replace the P.C. board. At this time, take caution not to pull the cables.
- After replacement of the P.C. board, actually operate the machine and confirm there is no problem with the P.C. board.

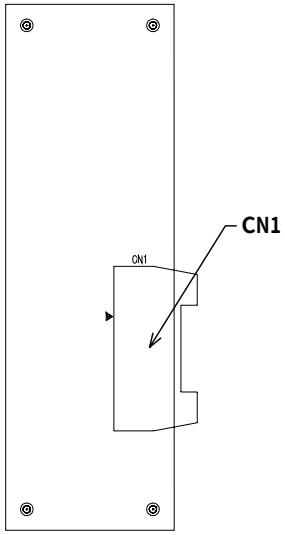
13.12.4. Adjustment

Adjust the variable resistor to its maximum volume. (Volume increases when the VR is turned counterclockwise.)

13.12.5. Precautions

No special precaution is required.

13.13. LED Lamp P.C. Board (BP01-25A)



13.13.1. General

The LED lamp P.C. board is mounted inside the case at the membrane panel switch section and performs the lamp ON/OFF indication.

13.13.2. Function of each part

CN1:(to LCD Display P.C. Board - CN13)

13.13.3. Replacement

- To replace this P.C. board, remove the rear cover at the operating section, the cover, and the LCD display P.C. board in advance. At that time, take sufficient caution when pulling out or inserting the cables.
- When removing the cover, remove the screws supporting it with hand so that the cover does not fall. Also, take caution on the handling of the cover since the touch panel and the LCD panel are attached to it.
- After replacement of the P.C. board, actually operate the machine and confirm there is no problem with the P.C. board.

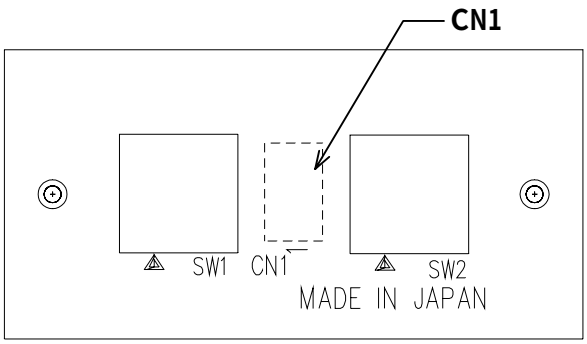
13.13.4. Adjustment

No adjustment is required.

13.13.5. Precautions

Take caution not to bend the LED pins.

13.14. Level Adjustment Switch P.C. Board (BP01-50B)



13.14.1. General

The level adjustment switch P.C. board is mounted inside the front door and makes the level adjustment of the bloodline.

The machine of TYPE 1 and TYPE 2 uses white key-top of SW1 and SW2.

The machine of TYPE 3 uses gray key-top of SW1 and SW2.

13.14.2. Function of each part

CN1: Switch output connector (to Mother P.C. board - CN12)

13.14.3. Replacement

- Note that the key top (white or gray) may come off.
- Take caution not to mount the P.C. board upside down. Also, actually operate the P.C. board and confirm the level adjustment in both the upper and lower directions.
- After replacement of the P.C. board, actually operate the machine and confirm there is no problem with the P.C. board.

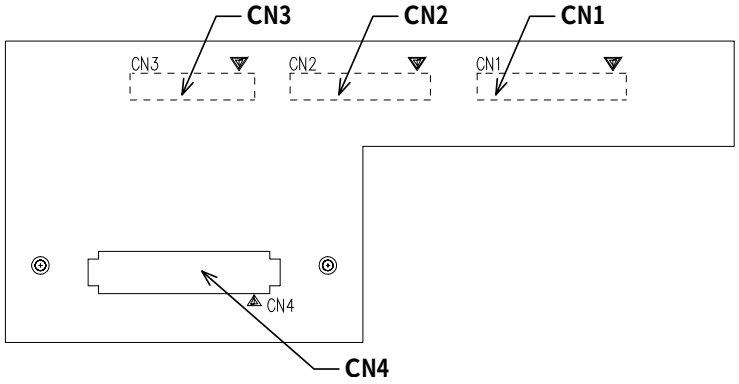
13.14.4. Adjustment

No adjustment is required.

13.14.5. Precautions

No special caution is required.

13.15. LCD Connector Conversion P.C. Board (BP02-30A)



13.15.1. General

The LCD connector conversion P.C. board is secured at the back of LCD panel and relays the signal from the LCD display P.C. board to the LCD panel.

13.15.2. Function of each part

CN1: LCD signal input connector (to LCD Display P.C. Board - CN2)
CN2: LCD signal input connector (to LCD Display P.C. Board - CN3)
CN3: LCD signal input connector (to LCD Display P.C. Board - CN4)
CN4: LCD signal output connector (to LCD panel- CN1)

13.15.3. Replacement

- To replace this P.C. board, remove the rear cover at the control panel and remove the LCD display P.C. board in advance. At that time, take sufficient caution when pulling out or inserting the cables.
- Insert in CN4 firmly to the connector of the LCD panel at the time of replacement.
- There are a machine, which is carrying out the screw stop of this P.C.Board to the LCD panel, and a machine, which is using the P.C.Board fixing bracket. Since it is fixing to the LCD panel using a small screw (M2x6 ISO metric thread with a washer and a spring washer) in the case of the former machine, be careful not to lose at the time of replacement.
- After replacement of the P.C. board, actually operate the machine and confirm there is no problem with the P.C. board.

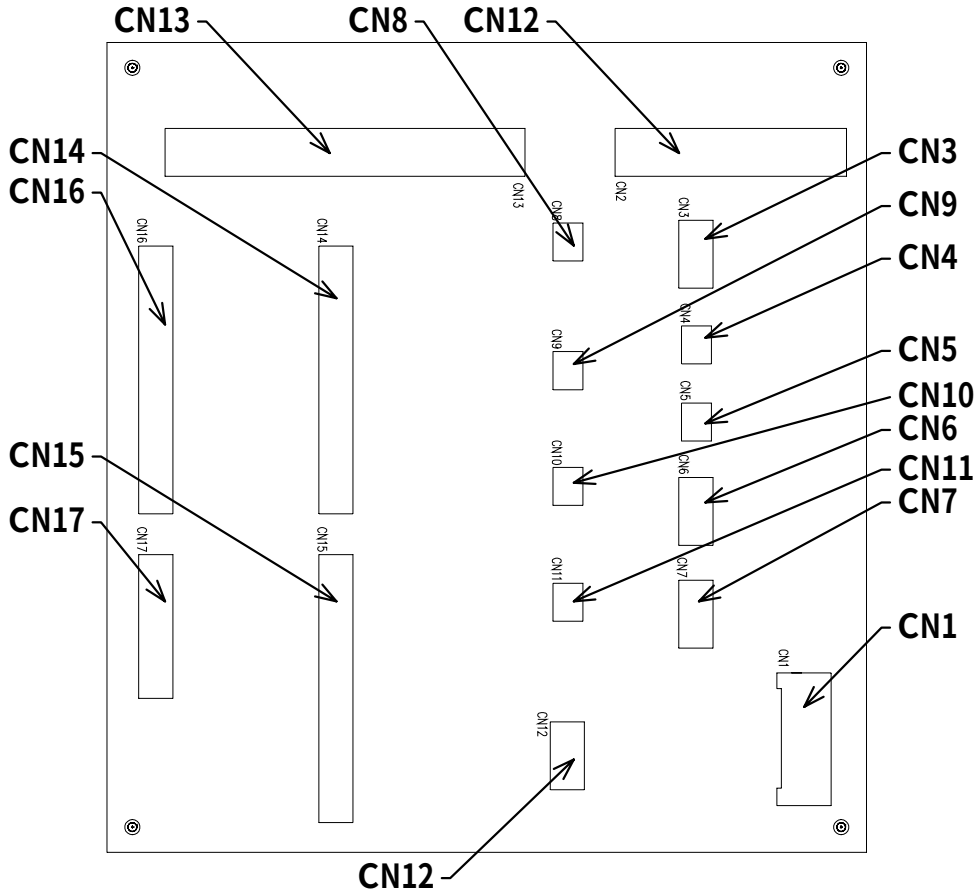
13.15.4. Adjustment

No adjustment is required.

13.15.5. Precautions

No special caution is required.

13.16. Connector P.C. Board (BP02-31B, BP02-31C)



13.16.1. General

The connector P.C. board is mounted at the top of the dialysate line unit inside the lower case and relays switch input signals, valve output signals, flow switch input signals, float level switch input signal, and rotation sensor input signal to or from the mother P.C. board.

The machine of TYPE 1 and TYPE 2 uses BP03-16A and BP02-31B.

The machine of TYPE 3 uses BP02-31C.

BP02-31C has a compatibility with the machine of TYPE 1 and TYPE 2.

13.16.2. Function of each part

CN1: Power supply input (+24 V, +5 V) connector (to power supply unit CN9)

CN2: Switches (SW1-11), Flow switches (FS1-3), Float level switch (FW), and Rotation sensor (RP1) output connector (to BP02-14A - CN19)

CN3: Switch input connector (to SW1, SW2)

CN4: Switch input connector (to SW3)

CN5: Switch input connector (to SW11) [Factory option.]

CN6: Switch input connector (to SW4, SW6)

CN7: Switch input connector (to SW9, SW10)

CN8: Float switch input connector (to FW)

CN9: Flow switch input connector (to FS1)

CN10: Flow switch input connector (to FS2)

CN11: Flow switch input connector (to FS3)

CN12: Rotation sensor input connector (to RP1a, RP1b)

CN13: Valve input (V1-V64, spare) and +24V power input connector (to Mother P.C. board - CN18)

CN14: Valve output connector (to V1, V2, V3, V4, V5, V12, V13, V14, V15, V35)

CN15: Valve output connector (to V21, V22, V23, V24, V25, V26, V27, V28, V43)

CN16: Valve output connector (to V11, V16, V31, V32, V33, V34, V41, V42, V51, V52)

CN17: Valve output connector (to V61, V62, V63, V64, and spare) [Factory option.]

13.16.3. Replacement

- To replace the P.C. board, open the front door of the lower case and draw out the dialysate line unit and then remove its top plate. Then, pull out the cables and remove the screws.
- Be sure to connect the cables correctly at the replacement. Also, actually operate the machine and confirm that there is no problem with the P.C. board. After the replacement of the P.C. board
- Take sufficient caution when inserting or pulling out the cables, always grabbing their connector housing.
- Take care not to drop the removed screw to other parts.
- After replacement of the P.C. board, actually operate the machine and confirm there is no problem with the P.C. board.

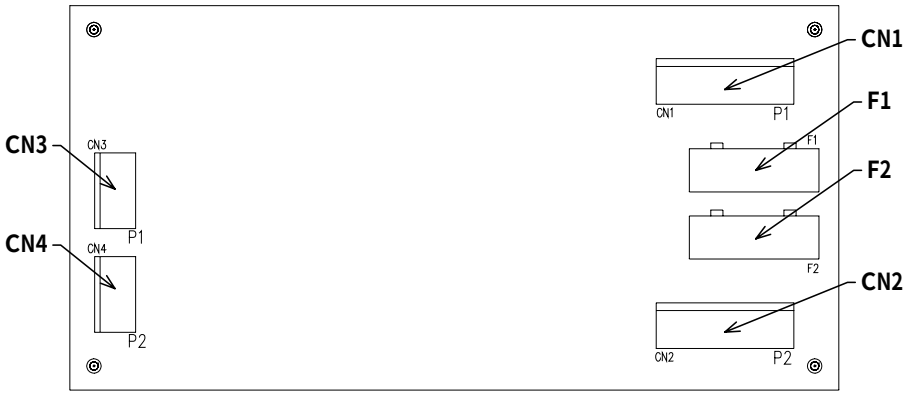
13.16.4. Adjustment

No adjustment is required.

13.16.5. Precautions

- Take sufficient caution when handling the connection cable.
- Take caution not to catch dialysate when servicing the dialysate line.

13.17. Pump Driver P.C. Board (BP03-10A, BP03-10B)



13.17.1. General

The pump driver P.C. board is mounted at the top of the dialysate line unit inside the lower case and drives and controls the pumps P1 and P2.

BP03-10A and BP03-10B is the same P.C.Board functionally.

13.17.2. Function of each part

CN1: Power supply and control signal input connector for pump (P1) (to Mother P.C. board – CN21)

CN2: Power supply and control signal input connector for pump (P2) (to Mother P.C. board - CN14)

CN3: Pump (P1) drive power supply and control signal output connector (to P1)

CN4: Pump (P2) drive power supply and control signal output connector (to P2)

F1: Fuse for pump P1 drive circuit (Tube fuse: AC250V T3.15AL)

F2: Fuse for pump P2 drive circuit (Tube fuse: AC250V T3.15AL)

13.17.3. Replacement

- To replace the P.C. board, open the front door of the lower case and draw out the dialysate line unit and then remove its top plate. Then, pull out the cables and remove the screws.
- Take sufficient caution when inserting or pulling out the cables, always grabbing their connector housing.
- Take care not to drop the removed screw to other parts.
- Be sure to turn OFF the power breaker when replacing the fuse.
- Use the following fuse.

  Glass tube type midget fuse: AC250V T3.15AL (250V 3A ϕ5.2×20mm)
- Take caution not to incorrectly connect the signal cables of the pumps P1 and P2. Perform the operation check to confirm that the cables are correctly connected after the replacement of the P.C. board.

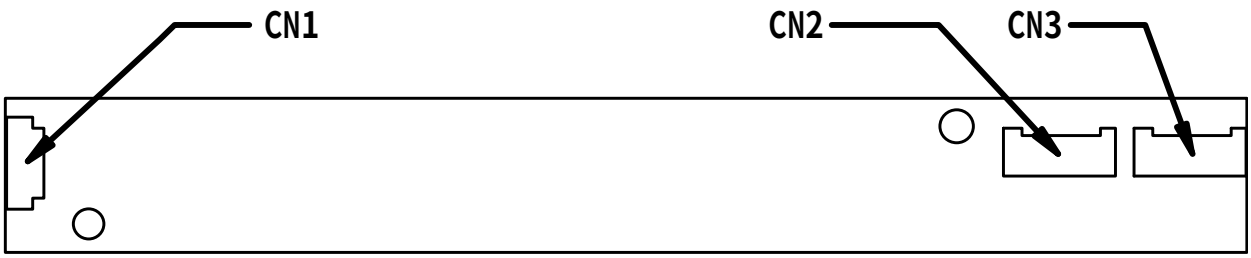
13.17.4. Adjustment

No adjustment is required since it is already adjusted at our factory before the shipment of the machine.

13.17.5. Precautions

- A fuse may be broken since it is a glass tube. Take sufficient caution when handling a fuse.
- Take caution not to catch dialysate when servicing the dialysate line.

13.18. Inverter P.C. Board (CXA-P1212B-WJL)



13.18.1. General

The inverter P.C. board is mounted in the vicinity of the LCD display P.C. board inside the case of the operating section and lights on the cold-cathode tube attached to the LCD panel.

13.18.2. Function of each part

CN1: Inverter supply input connector (LCD Display P.C. Board - CN9)

CN2: Inverter output connector (LCD panel - CN2 / CN3)

CN3: Inverter output connector (LCD panel - CN3 / CN2)

13.18.3. Replacement

- To replace the P.C. board, remove the rear cover at the operating section.
- Take care not to drop the removed screw to other parts.
- Hold the connector housing when inserting or pulling out the cables.
- Connections to CN2 and CN3 are interchangeable.
- After replacement of the P.C. board, actually operate the machine and confirm there is no problem with the P.C. board.

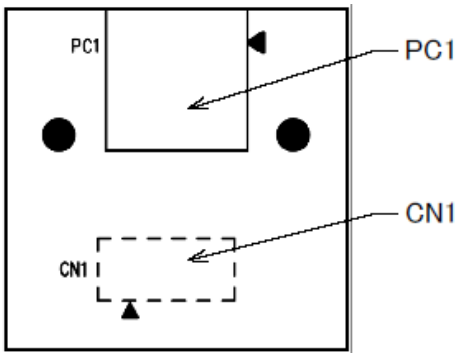
13.18.4. Adjustment

No adjustment is required.

13.18.5. Precautions

When touching the surrounding of the inverter P.C. board, turn OFF the power supply or put insulation material on the P.C. board so as not to touch it directly since there is a possibility of an electric shock because a high voltage is impressed on it.

13.19. UFP encoder P.C. Board (BP05-34)



13.19.1. General

The UFP encoder P.C. board is mounted on the UF pump, and outputs pulses according to rotation of the pump. (RP1a, RP1b:one pulse per rotation)

13.19.2. Function of each part

CN1: Pulses (RP1a, RP1b) output connector (to Connector P.C. Board – CN12)

PC1: Photo sensor

13.19.3. Replacement

- For the replacement, open the front door of the lower case and draw out the dialysate line unit. After removing the harness connected to UFP encoder P.C.board, remove the UF pump unit from the frame. (it's not necessary for removing the tube.) Remove the fixing bracket with the UFP encoder P.C.board from UF pump unit and replace the P.C.board.
- Hold the connector housing when inserting or pulling out the cables.
- After replacement of the P.C. board, actually operate the machine and confirm there is no problem with the P.C. board.

13.19.4. Adjustment

No adjustment is required.

13.19.5. Precautions

No special caution is required.

14 TECHNICIAN MODE AND MAKER MODE

14.1. TECHNICIAN Mode and MAKER Mode

The operators of this dialysis machine are classified into 3 groups (NURSE, TECHNICIAN, and MAKER) according to the level of required operations for the purpose of safety. The TECHNICIAN mode is used by qualified persons for the daily maintenance and inspection while the MAKER mode is used by the manufacturer of this machine for the inspection on the machine's delivery, etc.
A PASS I.D. is necessary for the operation in each mode excepting the NURSE mode. Strictly control the PASS I.D. so that any person excepting properly qualified operators cannot change the parameters.
A PASS I.D. is a combination of numerals up to eight digits.

The default PASS I.D. set upon shipment is as follows:

Mode	PASS I.D.
TECHNICIAN	458
MAKER	119

⚠ DANGER

In TECHNICIAN and MAKER modes, a wrong setting can cause machine malfunction as well as significant damage in the patient. Be sure to change the PASS I.D. after installing the machine. Manage the PASS I.D. under strict conditions.

⚠ CAUTION

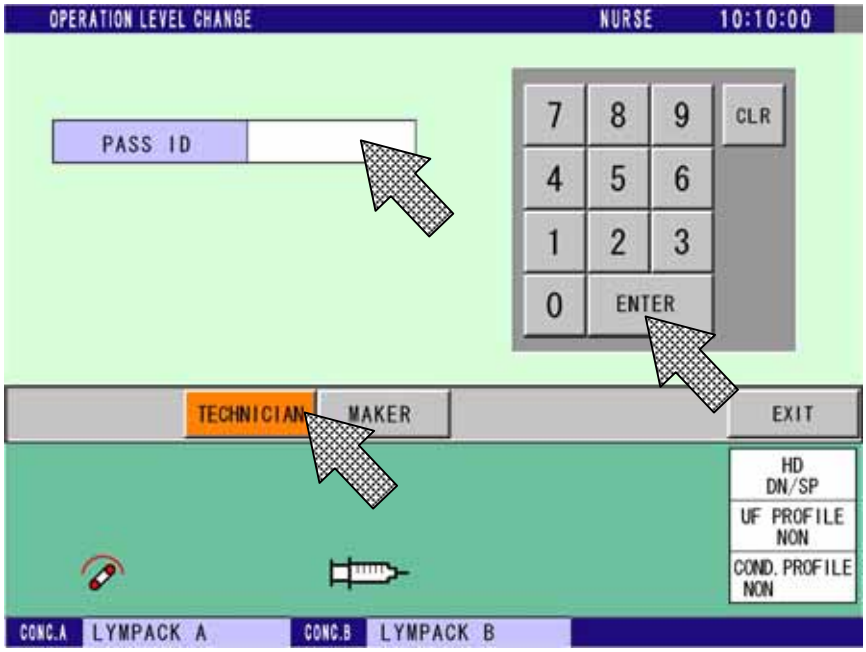
In both the TECHNICIAN and MAKER modes, the patient may get seriously injured or the machine may be defected if incorrect setting is made. Therefore, always allow only qualified persons to set parameters in both the TECHNICIAN and MAKER modes.

14.2. PASS I.D. Setting Method

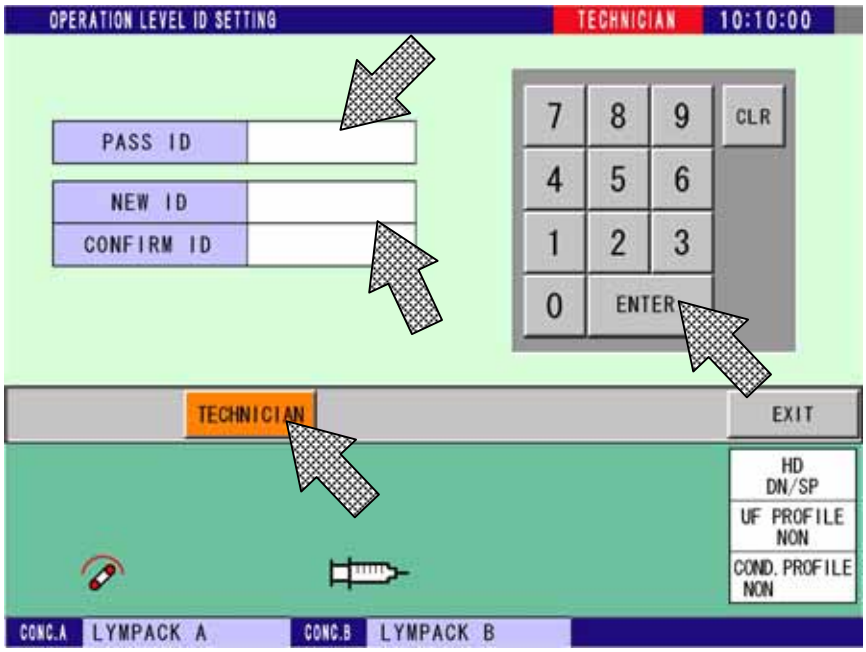
14.2.1. PASS I.D. setting for the MAKER mode

First of all, you have to login in the TECHNICIAN mode to set a PASS I.D.

1. The following login screen will be displayed by touching “NURSE” displayed at the upper right in the screen.



2. Confirm the TECHNICIAN button is in orange. Touch the blank column next to the PASS I.D., enter the default TECHNICIAN PASS I.D., and press the ENTER button.
3. “NURSE” displayed at the upper right changes into red and “TECHNICIAN” will be displayed. The system subsequently returns to the original screen.
4. Press the MENU button and select the TECHNICIAN tab.
   Select OPTION-OPERATION ID SETTING to display the following screen.

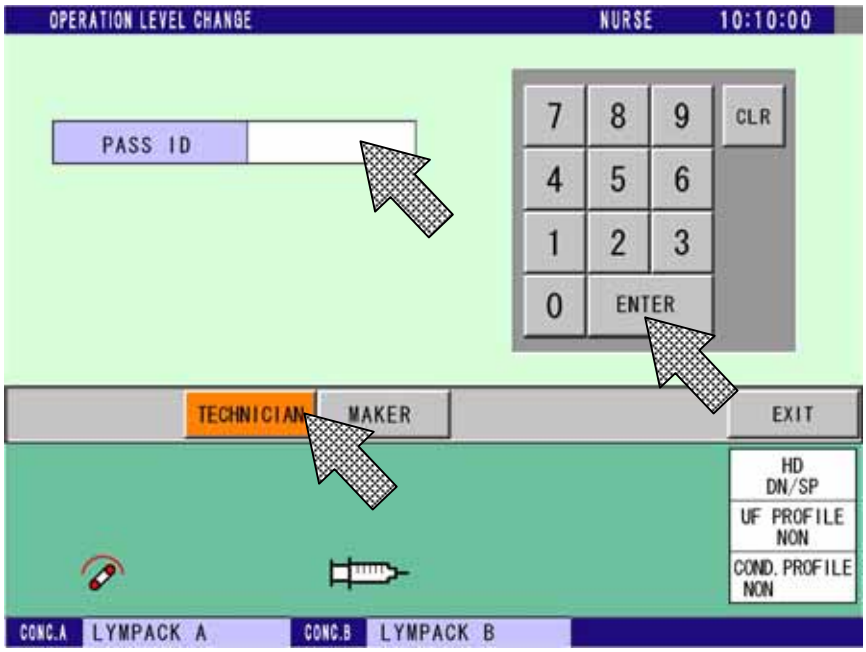


5. Confirm that the TECHNICIAN button turned orange. If the button is not orange, press the TECHNICIAN button.
6. Touch the blank column next to the PRESENT ID. Enter the default TECHNICIAN PASS I.D.
7. Touch the empty column at the right of “NEW ID” and input the new PASS I.D. for the maker, then touch the empty column at the right of “CONFIRM ID” and input the same PASS I.D. for the CONFIRM ID.
8. Press the ENTER button.
9. “NURSE” display changes into red and the machine enters the MAKER mode with “MAKER” displayed on the screen.

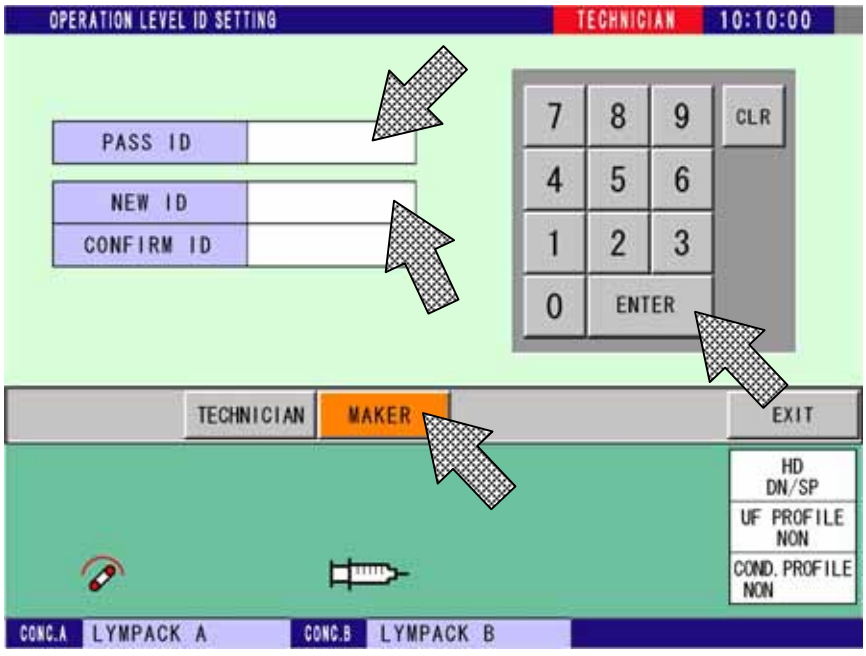
14.2.2. PASS I.D. setting for the TECHNICIAN mode

First of all, you have to login in the TECHNICIAN mode to set a PASS I.D.

1. The following login screen will be displayed by touching “NURSE” displayed at the upper right in the screen.



2. Confirm the TECHNICIAN button is in orange. Touch the blank column next to the PASS I.D., enter the preset TECHNICIAN PASS I.D., and press the ENTER button.
3. “NURSE” displayed at the upper right changes into red. “TECHNICIAN” will be displayed and the system returns to the original screen.
4. Press the MENU button, select the TECHNICIAN tab, and choose OPTION-OPERATION ID SETTING to display the following screen.

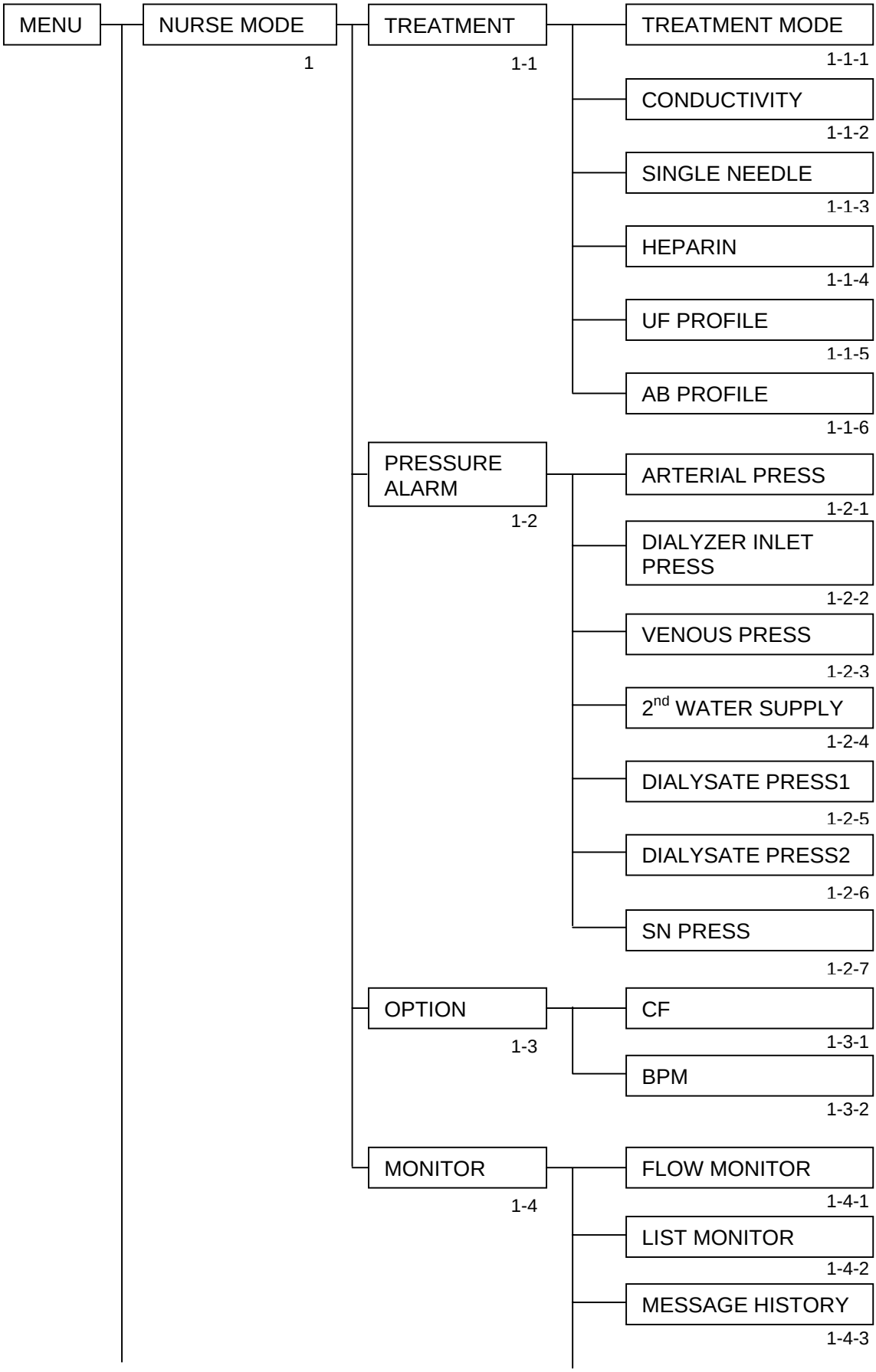


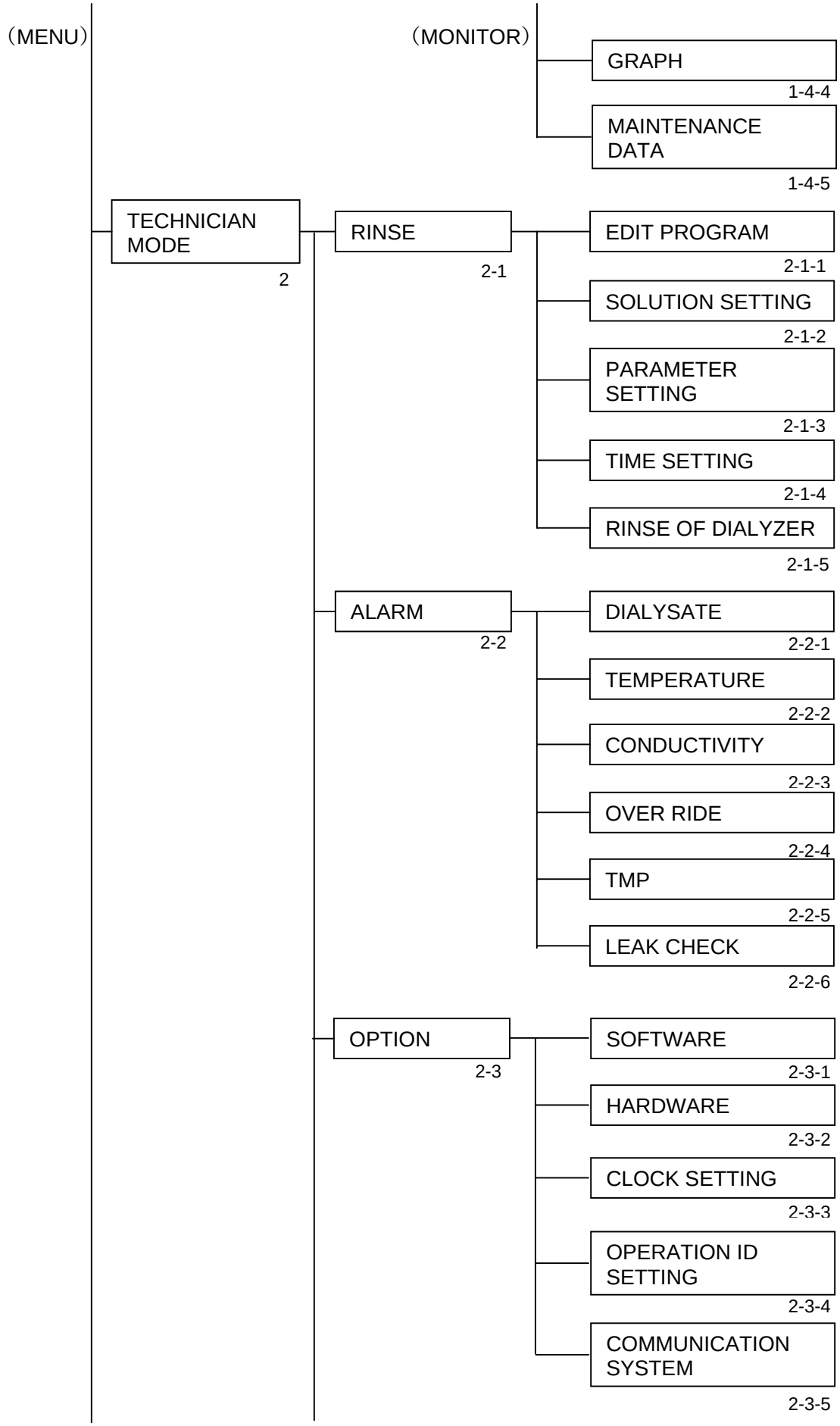
5. Confirm the MAKER button is in orange. If not, press the MAKER button.
6. Touch the blank column next to PRESENT I.D. and enter the default MAKER PASS I.D.

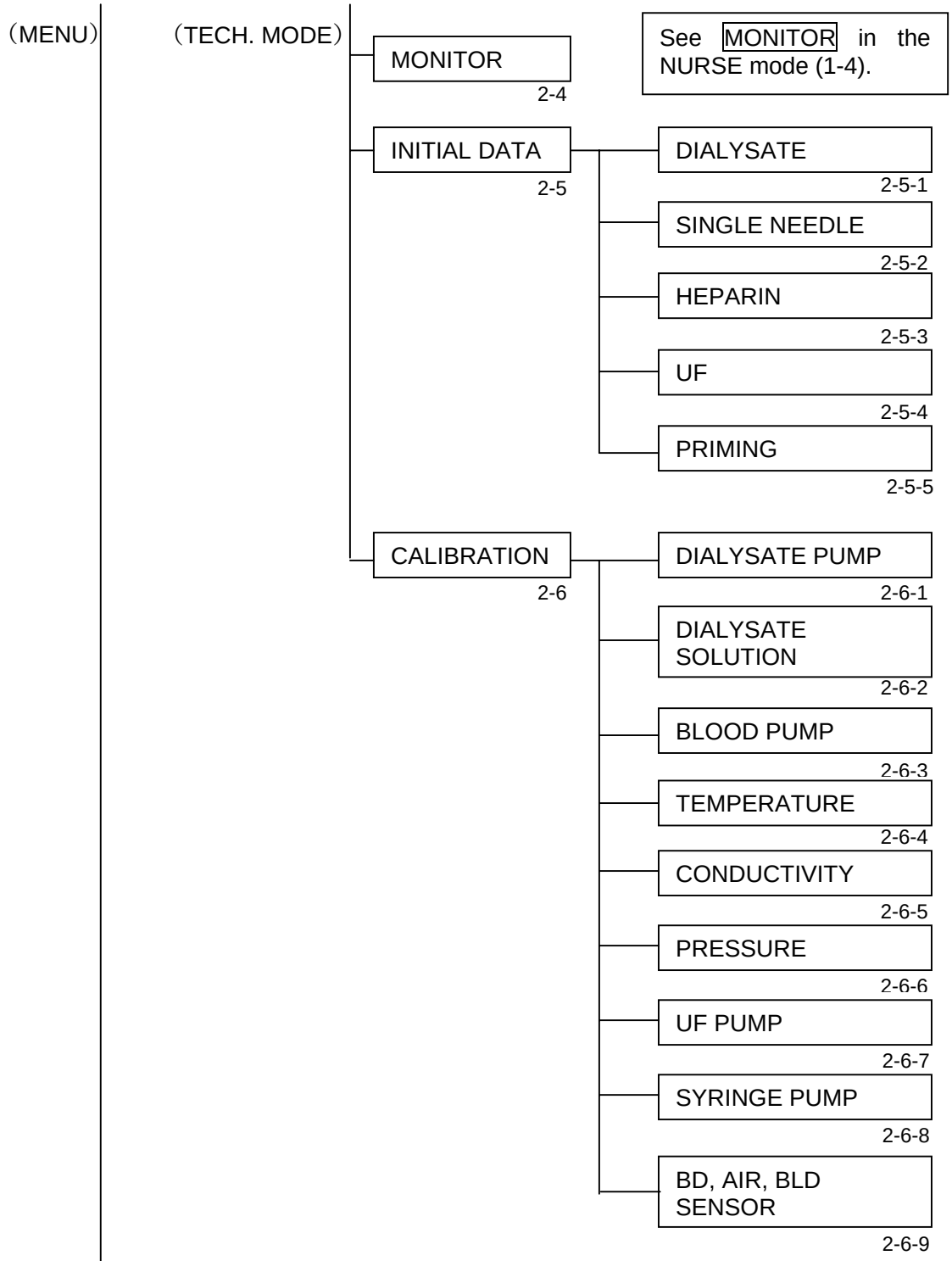
7. Touch the empty column at the right of “NEW ID” and input the new PASS I.D. for the technician, then touch the empty column at the right of “CONFIRM ID” and input the same PASS I.D. for the CONFIRM ID.
8. Press the ENTER button.
9. “NURSE” display changes into red and the machine enters the TECHNICIAN mode with “TECHNICIAN” displayed on the screen.

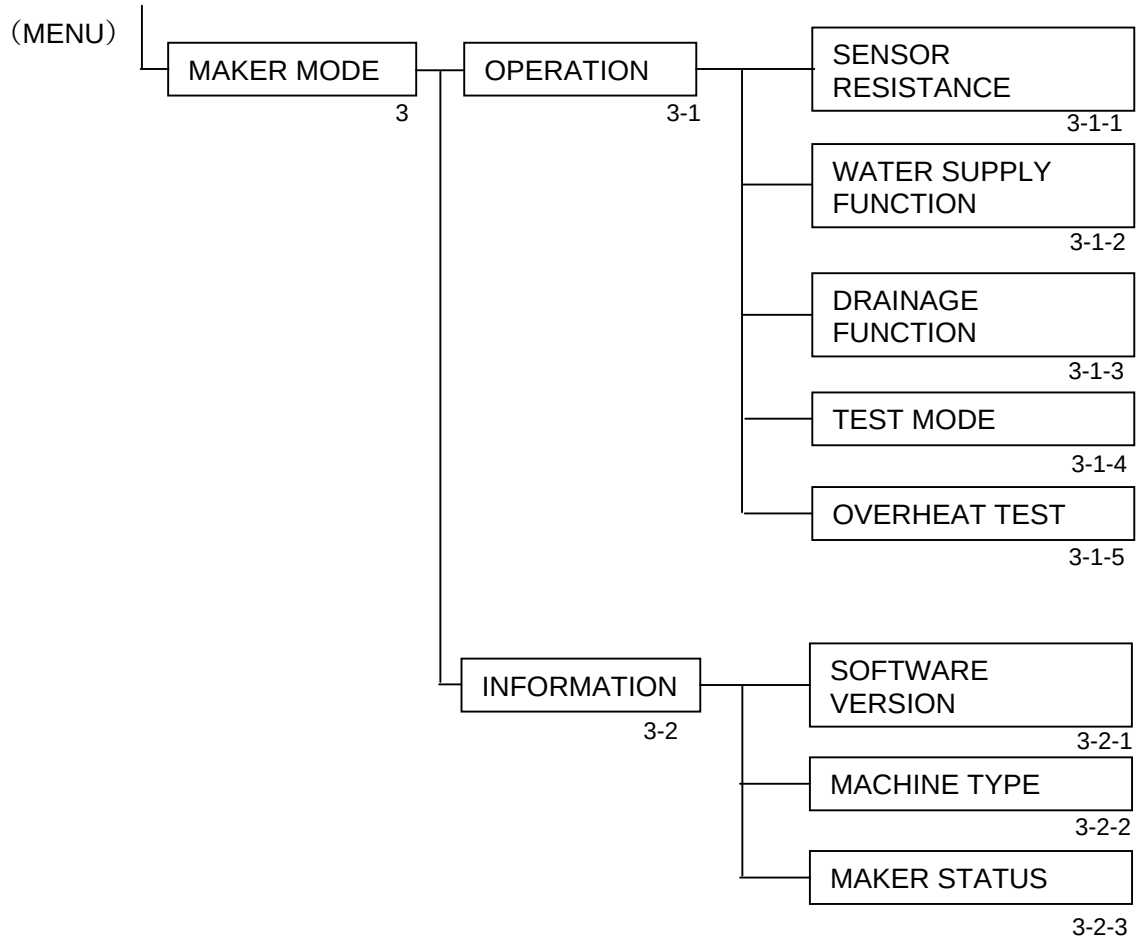
14.3. Setting Items on Each Screen

14.3.1. Hierarchy of setting menu




（MENU）
（MONITOR）
GRAPH
1-4-4
MAINTENANCE DATA
1-4-5
TECHNICIAN MODE
2
RINSE
2-1
EDIT PROGRAM
2-1-1
SOLUTION SETTING
2-1-2
PARAMETER SETTING
2-1-3
TIME SETTING
2-1-4
RINSE OF DIALYZER
2-1-5
ALARM
2-2
DIALYSATE
2-2-1
TEMPERATURE
2-2-2
CONDUCTIVITY
2-2-3
OVER RIDE
2-2-4
TMP
2-2-5
LEAK CHECK
2-2-6
OPTION
2-3
SOFTWARE
2-3-1
HARDWARE
2-3-2
CLOCK SETTING
2-3-3
OPERATION ID SETTING
2-3-4
COMMUNICATION SYSTEM
2-3-5


(MENU)
(TECH. MODE)
MONITOR
2-4
See MONITOR in the NURSE mode (1-4).
INITIAL DATA
2-5
DIALYSATE
2-5-1
SINGLE NEEDLE
2-5-2
HEPARIN
2-5-3
UF
2-5-4
PRIMING
2-5-5
CALIBRATION
2-6
DIALYSATE PUMP
2-6-1
DIALYSATE SOLUTION
2-6-2
BLOOD PUMP
2-6-3
TEMPERATURE
2-6-4
CONDUCTIVITY
2-6-5
PRESSURE
2-6-6
UF PUMP
2-6-7
SYRINGE PUMP
2-6-8
BD, AIR, BLD SENSOR
2-6-9


（MENU）
MAKER MODE
3
OPERATION
3-1
SENSOR RESISTANCE
3-1-1
WATER SUPPLY FUNCTION
3-1-2
DRAINAGE FUNCTION
3-1-3
TEST MODE
3-1-4
OVERHEAT TEST
3-1-5
INFORMATION
3-2
SOFTWARE VERSION
3-2-1
MACHINE TYPE
3-2-2
MAKER STATUS
3-2-3

MODE	TYPE	SET ITEM	DISPLAY/SW	NURSE	TECH.	MAKER	CONTENTS OF SETTING
NURSE	TREATMENT	TREATMENT MODE 1-1-1	HD SEQ-UF	○	←	←	Selection of treatment method
			DN/SP SN/SP	○	←	←	Selection of blood line
			DIALYSATE RATE	○	←	←	Setting of dialysate flow rate
			DIALYSATE TEMPERATURE	○	←	←	Setting of dialysate temperature
			B+W CONDUCTIVITY	○	←	←	Setting of B conductivity
			TOTAL CONDUCTIVITY	○	←	←	Setting of dialysate
			DIALYSIS BLOOD RATE	○	←	←	BP initial flow rate setting when dialysis begins
			RETRANS BLOOD RATE 1	○	←	←	BP1 initial flow rate when returning of blood begins
		CONDUCTIVITY 1-1-2	USE (No.1-No.4)	○	←	←	Selection of registered dialysate No.1 - No.4
			CONCENTRATE TYPE	○	←	←	Selection of BICARBO/ACETATE
			MIN (B+W)	×	○	←	Conductivity alarm lower limit setting (B + water)
			B+W	○	←	←	Target conductivity setting (B + water)
			MAX (B+W)	×	○	←	Conductivity alarm upper limit setting (B + water)
			MIN (TOTAL)	×	○	←	Conductivity alarm lower limit setting (A +B + water)
			TOTAL	○	←	←	Target conductivity (A +B + water)
			MAX (TOTAL)	×	○	←	Conductivity alarm upper limit setting (A +B + water)
		SINGLE NEEDLE 1-1-3	MIN	×	○	←	Blood pressure lower limit alarm setting during SN operation
			LOWER CHANGE POINT	○	←	←	Single needle (SN) switching pressure (lower limit) setting
			UPPER CHANGE POINT	○	←	←	Single needle (SN) switching pressure (upper limit) setting
			MAX	×	○	←	Blood pressure upper limit alarm setting during SN operation
		HEPARIN 1-1-4	START	○	←	←	Syringe pump ON/OFF
			BOLUS	○	←	←	Bolus ON/OFF
			RAPID	○	←	←	ON/OFF of syringe pump fast-forward operation
			FLOW RATE	○	←	←	Syringe pump flow rate setting
			AUTO BOLUS	○	←	←	ON/OFF of auto bolus setting
			BOLUS VOLUME	○	←	←	Setting of bolus volume for one time
			AUTO STOP	○	←	←	ON/OFF of automatic stop

MODE	TYPE	SET ITEM	DISPLAY/SW	NURSE	TECH.	MAKER	CONTENTS OF SETTING
NURSE	TREATMENT	UF PROFILE 1-1-5	USE	○	←	←	Use of UF profile being displayed
			?	○	←	←	Displays profile pattern prepared beforehand
			No, 1-No, 6	○	←	←	Selection of profile No.
			SEQ-UF	○	←	←	Selection of sequential UF operation of each slot in profile
		AB PROFILE 1-1-6	USE	○	←	←	Use of A and B profiles being displayed
			?	○	←	←	Displays profile pattern prepared beforehand
			No, 1-No, 6	○	←	←	Selection of profile No.
	PRESSURE ALARM	ARTERIAL PRESS. (PG4a) 1-2-1	LOWER WIDTH	○	←	←	Arterial pressure (before BP) alarm automatic setting range (lower limit side)
			UPPER WIDTH	○	←	←	Arterial pressure (before BP) alarm automatic setting range (upper limit side)
			MIN	×	○	←	Arterial pressure (before BP) limit alarm setting (lower limit side)
			LOWER LIMIT	×	○	←	Arterial pressure (before BP) lower limit alarm setting
			UPPER LIMIT	×	○	←	Arterial pressure (before BP) upper limit alarm setting
			MAX	×	○	←	Arterial pressure (before BP) limit alarm setting (upper limit side)
		DIALYZER INLET (PG4b) 1-2-2	LOWER WIDTH	○	←	←	Arterial pressure (after BP) alarm automatic setting range (lower limit side)
			UPPER WIDTH	○	←	←	Arterial pressure (after BP) alarm automatic setting range (upper limit side)
			MIN	×	×	○	Arterial pressure (after BP) limit alarm setting (lower limit side)
			LOWER LIMIT	×	○	←	Arterial pressure (after BP) lower limit alarm setting
			UPPER LIMIT	×	○	←	Arterial pressure (after BP) upper limit alarm setting
			MAX	×	×	○	Arterial pressure (after BP) limit alarm setting (upper limit side)
		VENOUS PRESS (PG5) 1-2-3	LOWER WIDTH	○	←	←	Venous pressure alarm automatic setting range (lower limit side)
			UPPER WIDTH	○	←	←	Venous pressure alarm automatic setting range (upper limit side)
			MIN	×	×	○	Venous pressure limit alarm setting (lower limit side)
			LOWER LIMIT	×	○	←	Venous pressure lower limit alarm setting
			UPPER LIMIT	×	○	←	Venous pressure upper limit alarm setting
			MAX	×	×	○	Venous pressure limit alarm setting (upper limit side)

MODE	TYPE	SET ITEM	DISPLAY/SW	NURSE	TECH.	MAKER	CONTENTS OF SETTING
NURSE	PRESSURE ALARM	2nd. WATER SUPPLY (PG1) 1-2-4	MIN	×	×	○	Secondary inlet water pressure limit alarm setting (lower limit side)
			LOWER LIMIT	×	○	←	Secondary inlet water pressure lower limit alarm setting
			UPPER LIMIT	×	○	←	Secondary inlet water pressure upper limit alarm setting
			MAX	×	×	○	Secondary inlet water pressure limit alarm setting (upper limit side)
		DIALYSATE PRESS1 (PG2) 1-2-5	LOWER WIDTH	○	←	←	Arterial side concentrate pressure alarm automatic setting range (lower limit side)
			UPPER WIDTH	○	←	←	Arterial side concentrate pressure alarm automatic setting range (upper limit side)
			MIN	×	×	○	Arterial side concentrate pressure limit alarm setting (lower limit side)
			LOWER LIMIT	×	○	←	Arterial side concentrate pressure lower limit alarm setting
			UPPER LIMIT	×	○	←	Arterial side concentrate pressure upper limit alarm setting
			MAX	×	×	○	Arterial side concentrate pressure limit alarm setting (upper limit side)
		DIALYSATE PRESS2 (PG3) 1-2-6	LOWER WIDTH	○	←	←	Concentrate pressure alarm automatic setting range (lower limit side)
			UPPER WIDTH	○	←	←	Concentrate pressure alarm automatic setting range (upper limit side)
			MIN	×	×	○	Concentrate pressure limit alarm setting (lower limit side)
			LOWER LIMIT	×	○	←	Concentrate pressure lower limit alarm setting
			UPPER LIMIT	×	○	←	Concentrate pressure upper limit alarm setting
			MAX	×	×	○	Concentrate pressure limit alarm setting (upper limit side)
		SN PRESS 1-2-7	MIN STROKE VOLUME	×	○	←	Lower limit of blood flow volume par one single needle (SN) cycle
			MAX STROKE TIME	×	○	←	Upper limit of blood flow time par one single needle (SN) cycle
			MAX VOLUME LIMIT	×	○	←	Lower limit of blood volume par one single needle (SN) cycle
			MIN	×	○	←	Blood pressure abnormal alarm lower limit setting
			LOWER WIDTH	×	○	←	Single needle chamber pressure alarm automatic setting range (lower limit side)
			UPPER WIDTH	×	○	←	Single needle chamber pressure alarm automatic setting range (upper limit side)
			MAX	×	○	←	Blood pressure abnormal alarm upper limit setting

MODE	TYPE	SET ITEM		DISPLAY/SW	NURSE	TECH.	MAKER	CONTENTS OF SETTING
NURSE	OPTION	CF OPTION 1-3-1		USE / UNUSE	○	←	←	Select Cut filter Option USE or UNUSE
				USE TIME	○	←	←	Cut filter use total time
				LIMIT TIME	×	○	←	Cut filter use time upper limit
				USE COUNT	○	←	←	Cut filter total use frequency (dialysis frequency)
				LIMIT COUNT	×	○	←	Cut filter use frequency upper limit
		BPM OPTION 1-3-2	BPM SETTING	OPTION	○	←	←	Select BPM option USE or UNUSE
				CONNECT	-	-	-	Establishment of communication with BPM unit
				CUFF PRESSURE	○	←	←	Setting of cuff pressure at the first measurement
				SMART PRESSURE INCREASING	○	←	←	Select SMART PRESSURE measurement function
				LOWER LIMIT (DIA, SYS, HR)	○	←	←	Blood pressure lower limit alarm setting
				UPPER LIMIT (DIA, SYS, HR)	○	←	←	Blood pressure upper limit alarm setting
			BPM PROFILE	USE / UNUSE	○	←	←	Select BPM Profile USE or UNUSE
				No.1 – No.3	○	←	←	Select Profiles
				SPAN TIME (SPAN 1 – 3)	○	←	←	Span time configure of Profiles
				INTERVAL TIME (SPAN 1 – 3)	○	←	←	Interval time configure of Profiles
				SMART TIME (SPAN 1 – 3)	○	←	←	Interval time configure of SMART PRESSURE measurement
				WARNING FOR START	○	←	←	Time setting from information to start measurement
				MEASUREMENT AT CHANGE	○	←	←	Setting of SMART PRESSURE measurement
				SETTING	○	←	←	Change screen to BPM setting
				PROFILE GRAPH	○	←	←	Change screen to BPM profiles
				MEASUREMENT	○	←	←	Start measurement
	MONITOR	FLOW MONITOR 1-4-1		FLOW1 FLOW2	○ (※)	←	←	Operating condition display of machine (Flow diagram) (* Forced out function is operative at TECHNICIAN or higher level.)
		LIST MONITOR 1-4-2		LIST	○ (※)	←	←	Operating condition display of machine (List) (* Forced out function is operative at TECHNICIAN or higher level.)
		MESSAGE HISTORY 1-4-3			○	←	←	Message history
		GRAPH 1-4-4			○	←	←	Transition graph of Conductivity, Temperature, Pressure, and so on.

MODE	TYPE	SET ITEM	DISPLAY/SW	NURSE	TECH.	MAKER	CONTENTS OF SETTING
NURSE	MONITOR	MAINTENANCEDATA 1-4-5		○	←	←	Total driving time of each part/driving count
TECH NICIAN	RINSE	EDIT PROGRAM 2-1-1		×	○	←	Rinse program making screen
		SOLUTION SETTING 2-1-2	CONCENTRATION ORIGIN	×	○	←	Concentration of disinfectant to be used for rinse
			CONCENTRATION DILUTION	×	○	←	Dilution ratio of disinfectant to be used for rinse
			CONDUCTIVITY LOWER LIMIT	×	○	←	Conductivity lower limit alarm value after disinfectant dilution
			CONDUCTIVITY UPPER LIMIT	×	○	←	Conductivity upper limit alarm value after disinfectant dilution
			INHALATION PORT	×	○	←	Selection of disinfectant port to be used (when rinse port option is used)
		PARAMETER SETTING 2-1-3	SINGLE PASS RATE	×	○	←	Liquid flow rate setting at rinse
			RECIRCURATION RATE	×	○	←	Liquid flow rate setting at circulation rinse
			LINE CAPACITY	×	×	○	Total capacity inside line
			AUTO PREPARATION AFTER RINSE	×	○	←	Auto start setting to dialysis preparation process after rinse is complete (Only at the time disinfection end become effective.)
			AUTO PREPARATION AFTER POWER ON	×	○	←	Auto start setting to dialysis preparation process after power supply is turned ON (Only at the time disinfection end become effective.)
			ADDITIONAL VOLUME	×	×	○	Amount in tube at disinfectant port
			REVERSE TIME	×	×	○	Exchange amount in reverse flush of disinfectant port
			USE / UNUSE	×	○	←	Select 2nd Rinse port option USE or UNUSE
		TIME SETTING 2-1-4	RINSE MIN.TIME	×	×	○	Minimum time for setting each rinse method in RINSE EDIT
			AFTER WATER RINSE TIME	×	×	○	Minimum time setting of WATER RINSE necessary after each rinse in RINSE EDIT
			HEATING TIME	×	×	○	Setting of time necessary to reach set temperature
		RINSE OF DIALYSER 2-1-5	RINSE TIME	×	○	←	Setting of dialyzer rinse time upper limit
			UF GOAL	×	○	←	UF volume done during dialyzer rinse time set at RINSE TIME
			BLOOD LEAK SENSOR	×	○	←	Blood leak Monitor setting at dialyzer rinse
			BLOOD LEAK MAX	×	○	←	Blood leak alarm maximum value at dialyzer rinse
	ALARM	DIALYSATE 2-2-1	P1 FLOW RATE RATIO	×	×	○	Deaeration pump flow rate abnormality setting (Tolerance of real flow rate to set flow rate)

MODE	TYPE	SET ITEM	DISPLAY/SW	NURSE	TECH.	MAKER	CONTENTS OF SETTING
TECHNICIAN	ALARM	DIALYSATE 2-2-1	P2 FLOW RATE RATIO	×	×	○	Dialysate pump flow rate abnormality setting (Tolerance of real flow rate to set flow rate)
			MAX RATIO of UF to BP	×	○	←	Limit flow rate ratio of blood pump to UF pump
			MICROBUBBLE LEVEL	×	○	←	Capacity of air bubbles that air bubble detector counts (Under Development)
			MICROBUBBLE TOTAL	×	○	←	Total capacity of air bubbles at which air bubble detector outputs signal (Under Development)
			BLOOD LEAK MAX	×	○	←	Maximum value at which blood leak detector outputs signal
			BP STOP	×	○	←	Time setting when detector outputs signal since blood pump stops
		TEMPERATURE 2-2-2	LOWER LIMIT	×	○	←	Temperature alarm lower limit set value
			UPPER LIMIT	×	○	←	Temperature alarm upper limit set value
			DIFFERENCE JUDGE TEMPERATURE	×	×	○	Temperature difference alarm output condition 1 (T1-T3/T2-T4)
			DIFFERENCE JUDGE TIME	×	×	○	Temperature difference alarm output condition 2 (T2-T4)
		CONDUCTIVITY 2-2-3	B+W WIDTH	×	○	←	Conductivity allowable width (B concentrate + water)
			TOTAL WIDTH	×	○	←	Conductivity allowable width (Dialysate)
			SOLUTION CHECK B+W	×	○	←	Dialysate abnormality alarm output upper /lower limit set values (B concentrate + water)
			SOLUTION CHECK TOTAL	×	○	←	Dialysate abnormality alarm output upper/lower limit set values (Dialysate)
			DIFFERENCE JUDGE B+W	×	×	○	Conductivity difference alarm output condition 1 (CD2-CD4)
			DIFFERENCE JUDGE TOTAL	×	×	○	Conductivity difference alarm output condition 1 (CD1-CD3)
			DIFFERENCE JUDGE TIME	×	×	○	Conductivity difference alarm output condition 2 (CD1-CD3/CD2-CD4)
		OVER RIDE 2-2-4	TIME	×	○	←	Setting of possible operation time in OVERRIDE mode
			COUNT	×	○	←	Possible operation speed of blood pump in OVERRIDE mode
		TMP 2-2-5	AUTO OFFSET	×	○	←	TMP (transmembrane pressure) automatic offset switching
			MANUAL OFFSET	×	○	←	Offset value when dialysis begins
			LOWER LIMIT	×	○	←	TMP (transmembrane pressure) abnormality alarm lowermost limit value setting
			UPPER LIMIT	×	○	←	TMP (transmembrane pressure) abnormality alarm uppermost limit value setting

MODE	TYPE	SET ITEM	DISPLAY/SW	NURSE	TECH.	MAKER	CONTENTS OF SETTING
TECHNICIAN	ALARM	LEAK CHECK 2-2-6	TARGET PRESSURE	×	○	←	Pressure build-up target setting when leak check is performed
			TARGET TIME	×	○	←	Pressure build-up time upper limit setting when leak check is performed
			HOLD TIME	×	○	←	Pressure change measuring time setting when leak check is performed
			PRESSURE LIMIT	×	○	←	Permissible leak pressure width setting
			INTERVAL	×	○	←	Interval time setting of leak check to be done during dialysis process
			STARTUP TEST	×	○	←	Leak check test additional setting at startup test
	OPTION	SOFTWARE 2-3-1	PREP AT SEQ-UF	×	○	←	Machine operation setting for dialysate at SEQ-UF operation
			AUTO BYPASS AT BP STOP	×	○	←	Switching of automatic bypass system when blood pump stops
			RINSE SKIP BY NURSE	×	○	←	Switching of permission to omit water-washing process in NURSE mode
			MELODY AT TREATMENT END	×	○	←	Selection of melody to sound when dialysis completes
			TEST	×	○	←	Sounding selected melody sound
			BP STOP BY BLOOD AT CONNECT	×	○	←	Blood pump automatic stop switch at patient connection
			BP STOP BY SALINE AT RETRANS	×	○	←	Blood pump automatic stop switch at retransfusion
			AUTO MUTE TIME	×	○	←	Time until alarm sound stops (Alarm is output 2 min. later when 0 min. is set.) Rinse mode become effective.
			TIME LIMIT FOR DIALYSIS BUTTON	×	○	←	Setting of time until message to urge the move to dialysis is output after dialysis preparation is complete
			AIR SEPARATOR MAX	×	○	←	Frequency of AS2 error until dialysis is interrupted
			MULTILINGUAL	×	○	←	Switching of multi-language function (switching installed languages and English)
			POINTER	×	○	←	Switching of cursor display function
			AUTO ESC	×	○	←	
		HARDWARE 2-3-2	PG1	×	○	←	Switching of software setting when optional mechanism is added
			PG2	×	○	←	Switching of software setting when optional mechanism is added
			PG4b	×	○	←	Switching of software setting when optional mechanism is added
			PG6	×	○	←	Switching of software setting when optional mechanism is added

MODE	TYPE	SET ITEM	DISPLAY/SW	NURSE	TECH.	MAKER	CONTENTS OF SETTING
TECHNICIAN	OPTION	HARDWARE 2-3-2	B-POWDER	×	○	←	Switching of software setting when optional mechanism is added
			FS3	×	○	←	Switching of software setting when optional mechanism is added
		CLOCK SETTING 2-3-3	DATE	×	○	←	Setting change of "month" and "date"
			WEEK	×	○	←	Setting change of "day of a week"
			TIME	×	○	←	Setting change of "time"
		OPERATION ID SETTING 2-3-4	PRESENT ID	×	○	←	Present password input column when changing password
			NEW ID	×	○	←	New password input column when changing password
			CONFIRM ID	×	○	←	New password input column when changing password (for inputting for confirmation)
		COMUNICATION SYSTEM	OPTION	×	○	←	Select communication system USE or UNUSE
			No.1	×	○	←	Setting of machine No.
			SPEED	×	○	←	Baud rate setting
	MONITOR	FLOW MONITOR 2-4-1	FLOW1 FLOW2	○ (※)	←	←	Operating condition display of machine (Flow diagram) (* Forced out function is operative at TECHNICIAN or higher level.)
		LIST MONITOR 2-4-2	LIST	○ (※)	←	←	Operating condition display of machine (List) (* Forced out function is operative at TECHNICIAN or higher level.)
		MESSAGE HISTORY 2-4-3		○	←	←	Message history
		GRAPH 2-4-4		○	←	←	Transition graph of T, CD, PG
		MAINTENANCE DATA 2-4-5		○	←	←	Total driving time of each part/driving count
	INITIAL DATA	DIALYSATE 2-5-1	FLOW RATE	×	○	←	Dialysate flow rate initial setting
			MIN	×	○	←	Temperature possible setting range lower limit
			TEMPERATURE	×	○	←	Set temperature initial setting
			MAX	×	○	←	Temperature possible setting range upper limit
			BP1 RATE MAX	×	○	←	Blood pump 1 possible setting range upper limit
		SINGLE NEEDLE 2-5-2	MIN	×	○	←	Single needle (SN) switch operating pressure possible setting range Minimum value
			CHANGE LOWER POINT	×	○	←	Single needle (SN) switch operation lower limit set value
			CHANGE UPPER POINT	×	○	←	Single needle (SN) switch operation upper limit set value

MODE	TYPE	SET ITEM	DISPLAY/SW	NURSE	TECH.	MAKER	CONTENTS OF SETTING
TECHNICIAN	INITIAL DATA	SINGLE NEEDLE 2-5-2	MAX	×	○	←	Single needle (SN) switch operating pressure possible setting range Maximum value
			BP1 RATE	×	○	←	BP1 flow rate initial set value for single needle (SN) operation
			BP1 RATE MAX	×	○	←	BP1 flow rate possible setting range Max. value for single needle (SN) operation
		HEPARIN 2-5-3	FLOW RATE	×	○	←	Syringe pump flow rate initial set value
			MAX FLOW RATE	×	○	←	Syringe pump flow rate possible setting range Maximum value
			AUTO BOLUS	×	○	←	Automatic BOLUS setting at beginning of dialysis
			BOLUS VOLUME	×	○	←	Initial setting of BOLUS volume
			AUTO STOP TIME	×	○	←	Setting of time until dialysis completes after syringe pump automatic operation stops
			CONNECTED STOP	×	○	←	Interlock setting between blood pump and syringe pump
		UF 2-5-4	GOAL	×	○	←	Total UF (ultrafiltration) volume initial setting
			REMAINNG TIME	×	○	←	Initial setting of remaining time until UF (ultrafiltration) completes
			MIN	×	○	←	UF (ultrafiltration) speed possible setting range Minimum value
			RATE	×	○	←	UF (ultrafiltration) speed initial setting
			MAX	×	○	←	UF (ultrafiltration) speed possible setting range Maximum value
			MIN-UF RATE	×	○	←	UF (ultrafiltration) speed (for MIN-UF) possible setting range Maximum value
			AUTO CAL. LIMIT	×	○	←	
			UF SETTING ON BYPASS	×	○	←	UF pump operation specification during bypass operation
			UF MODE	×	○	←	Selection of UF (ultrafiltration) method
		PRIMING 2-5-5	VOLUME (Ar/Ve/Recirculation)	×	○	←	Priming volume of blood line (Used at an auto. priming.)
			RATE (Ar/Ve/Recirculation)	×	○	←	Flow rate setting at auto. priming
	CALIBRATION	DIALYSATE PUMP 2-6-1	RV1 BUTTON	×	○	←	Calibration button (only manufacturer use on shipment)
			RV2 BUTTON	×	×	○	Calibration button (only manufacturer use on shipment)
			CHECK	×	○	←	Calibration button for RV2
			CAPACITY CHAMBER A	×	○	←	Capacity of chamber A
			CAPACITY CHAMBER B	×	○	←	Capacity of chamber B

MODE	TYPE	SET ITEM	DISPLAY/SW	NURSE	TECH.	MAKER	CONTENTS OF SETTING
TECHNICIAN	CALIBRATION	DIALYSATE SOLUTION 2-6-2	CONCENTRATE TYPE	×	○	←	Type selection of disinfectant to be used
			SOLUTION A (or B)	×	○	←	Name of dialysate to be used
			ESTIMATED. COND	×	○	←	Estimated conductivity
			ALARM (TOTAL / B)	×	○	←	Allowable width of Solution Check
			CONDUCTIVITY (TOTAL /B)	×	○	←	Conductivity at calibration by concentrate
			DILUTION (TOTAL / B)	×	○	←	Dilution ratio setting
			MIN (TOTAL / B)	×	○	←	Solution Check alarm lower limit set value
			INITIAL (TOTAL / B)	×	○	←	Target value of diluted concentrate
			MAX (TOTAL / B)	×	○	←	Solution Check alarm upper limit set value
			PREPARE RATIO	×	○	←	Standard ratio
		BLOOD PUMP 2-6-3	OFFSET (205dig)	×	○	←	Blood pump calibration start button
			GAIN (1023dig)	×	○	←	Blood pump calibration start button
			8.25mm/6.35mm	×	○	←	Tube dia. Selection at blood pump of blood circuit for calibration
			CHECK 100	×	○	←	Flow rate Check button (only manufacturer use on shipment)
			CHECK 300	×	○	←	Flow rate Check button (only manufacturer use on shipment)
			CHECK 600	×	○	←	Flow rate Check button (only manufacturer use on shipment)
			START VOLUME	×	○	←	Entry field to input value on calibration
			END VOLUME	×	○	←	Entry field to input value on calibration
			ACTUAL VOLUME	×	○	←	Display field of the measurement result
		TEMPERATURE 2-6-4	VALUE (CPU1/CPU2)	×	○	←	Indication value of each temperature sensor (CPU1: Control P.C. board; CPU2: Monitor P.C. board)
			A/D (CPU1/CPU2)	×	○	←	Indication value of each temperature sensor (A/D value) (CPU1: Control P.C. board; CPU2: Monitor P.C. board)
			COEFFICIENT (a1/b1)	×	○	←	Correction coefficient a (gain) and b (offset) for CPU1: Control P.C. board
			COEFFICIENT (a2/b2)	×	○	←	Correction coefficient a (gain) and b (offset) for CPU2: Monitor P.C. board
			CHECK	×	○	←	Calibration start button
			OFFSET	×	○	←	Calibration start button

MODE	TYPE	SET ITEM	DISPLAY/SW	NURSE	TECH.	MAKER	CONTENTS OF SETTING
TECHNICIAN	CALIBRATION	TEMPERATURE 2-6-4	LOW POINT/HIGH POINT	×	○	←	Temperature calibration start button at machine adjustment on shipment
			TEST	×	○	←	Analogue signal output button
			SAVE	×	○	←	Save button to save calculated value (only manufacturer use on shipment)
			CLEAR	×	○	←	Clear button to clear previous value
		CONDUCTIVITY 2-6-5	TEMPERATURE COEFFICIENT	×	×	○	Temperature correction coefficient of conductivity sensor value
			VALUE (CPU1/CPU2)	×	○	←	Indication value of each conductivity sensor (CPU1: Control P.C. board; CPU2: Monitor P.C. board)
			A/D (CPU1/CPU2)	×	○	←	Indication value of each conductivity sensor (A/D value) (CPU1: Control P.C. board; CPU2: Monitor P.C. board)
			COEFFICIENT (a1/b1)	×	○	←	Correction coefficient a (gain) and b (offset) for CPU1: Control P.C. board
			COEFFICIENT (a2/b2)	×	○	←	Correction coefficient a (gain) and b (offset) for CPU2: Monitor P.C. board
			CHECK	×	○	←	Calibration start button
			OFFSET	×	○	←	Calibration start button
			LOW POINT/HIGH POINT	×	○	←	Conductivity calibration start button at machine adjustment on shipment
			TEST	×	○	←	Analogue signal output button
			SAVE	×	○	←	Save button to save calculated value (only manufacturer use on shipment)
			CLEAR	×	○	←	Clear button to clear previous value
		PRESSURE 2-6-6	VALUE (CPU1/CPU2)	×	○	←	Indication value of each pressure sensor (CPU1: Control P.C. board; CPU2: Monitor P.C. board)
			A/D (CPU1/CPU2)	×	○	←	Indication value of each pressure sensor (A/D value) (CPU1: Control P.C. board; CPU2: Monitor P.C. board)
			COEFFICIENT (a1/b1)	×	○	←	Correction coefficient a (gain) and b (offset) for CPU1: Control P.C. board
			COEFFICIENT (a2/b2)	×	○	←	Correction coefficient a (gain) and b (offset) for CPU2: Monitor P.C. board
			CHECK	×	○	←	Calibration start button
			OFFSET	×	○	←	Calibration start button
			LOW POINT/HIGH POINT	×	○	←	Pressure sensor calibration start button at shipping adjustment

MODE	TYPE	SET ITEM	DISPLAY/SW	NURSE	TECH.	MAKER	CONTENTS OF SETTING
TECHNICIAN	CALIBRATION	PRESSURE 2-6-6	DRAIN	×	○	←	
			PRIMING	×	○	←	
		UF PUMP 2-6-7	UF RATE	×	○	←	UF RATE calibration start button
			TIME LEFT	×	○	←	Setting of Calibration time
			NORMAL/SINGLE FILTER/DOUBLE FILTER	×	○	←	No CF option / with CF1 option / with CF1 and CF2 options
			a	×	○	←	Correction coefficient of UF volume: Pressure coefficient
			b	×	○	←	Correction coefficient of UF volume: Dialysate flow rate coefficient
			c	×	○	←	Correction coefficient of UF volume: BP flow rate coefficient
			d	×	○	←	Correction coefficient of UF volume: Offset value
			d'	×	○	←	Correction coefficient of UF volume: Offset at sequential UF
			START PRESSURE	×	○	←	Correction application range upper limit (PG3) by a-d' correction value
			BP RATE	×	○	←	Blood pump flow rate on calibration
			ONE SHOT	×	○	←	One shot capacity of UF pump
			HD OFFSET	×	○	←	HD offset calibration start button
			HD L.CHECK	×	○	←	HD offset check button (Lower point)
			HD H.CHECK	×	○	←	HD offset check button (Higher point)
			SEQ OFFSET	×	○	←	SEQ offset calibration start button
			SEQ CHECK	×	○	←	SEQ offset check button
			START VOLUME	×	○	←	Entry field to input value on calibration
			END VOLUME	×	○	←	Entry field to input value on calibration
			ACTUAL VOLUME	×	○	←	Display field of the measurement result
		SYRINGE PUMP 2-6-8	SYRINGE SIZE	×	○	←	Size setting of syringe to be used
			RATIO	×	○	←	Operation speed ratio to standard syringe (20mL)
			BOLUS	×	○	←	BOLUS Check button (only manufacturer use on shipment)
			RATE	×	○	←	RATE Check button (only manufacturer use on shipment)
			LIMIT SW	×	○	←	LIMIT SW Check button (only manufacturer use on shipment)
			START VOLUME	×	○	←	Entry field to input value on calibration

MODE	TYPE	SET ITEM		DISPLAY/SW	NURSE	TECH.	MAKER	CONTENTS OF SETTING
TECHNICIAN	CALIBRATION	SYRINGE PUMP 2-6-8		END VOLUME	×	○	←	Entry field to input value on calibration
				ACTUAL VOLUE	×	○	←	Display field of the measurement result
		BD, AIR, BLD SENSOR 2-6-9	BD	STANDARD	×	○	←	Input the value of normal value
				THRESHOLD	×	○	←	Display of threshold value
			BLD	VALUE (CPU1/CPU2)	×	○	←	Indication value of blood leak detector (CPU1: Control P.C. board; CPU2: Monitor P.C. board)
				A/D (CPU1/CPU2)	×	○	←	Indication value of blood leak detector (A/D value) (CPU1: Control P.C. board; CPU2: Monitor P.C. board)
				COEFFICIENT (a1/b1)	×	○	←	Correction coefficient a (gain) and b (offset) for CPU1: Control P.C. board
				COEFFICIENT (a2/b2)	×	○	←	Correction coefficient a (gain) and b (offset) for CPU2: Monitor P.C. board
				ZEROIZE	×	○	←	Button to reset "VALUE" value to 0
			AIR	VALUE (CPU1/CPU2)	×	○	←	Indication value of air bubble detector (CPU1: Control P.C. board; CPU2: Monitor P.C. board)
				A/D (CPU1/CPU2)	×	○	←	Indication value of air bubble detector (A/D value) (CPU1: Control P.C. board; CPU2: Monitor P.C. board)
				COEFFICIENT (a1/b1)	×	○	←	Correction coefficient a (gain) and b (offset) for CPU1: Control P.C. board
				COEFFICIENT (a2/b2)	×	○	←	Correction coefficient a (gain) and b (offset) for CPU2: Monitor P.C. board
MAKER	PARAMETER	SENSOR RESISTANCE 3-1-1		0°C	×	×	○	Temperature characteristic value of thermistor (resistance at 0°C)
				37°C	×	×	○	Temperature characteristic value of thermistor (resistance at 37°C)
				100°C	×	×	○	Temperature characteristic value of thermistor (resistance at 100°C)
				32°C	×	×	○	Temperature characteristic value of thermistor (resistance at 32°C) (for T1-T4)
				37°C	×	×	○	Temperature characteristic value of thermistor (resistance at 37°C) (for T1-T4)
				41°C	×	×	○	Temperature characteristic value of thermistor (resistance at 41°C) (for T1-T4)
		WATER SUPPLY FUNCTION 3-1-2		START	×	×	○	Water supply operation start button

MODE	TYPE	SET ITEM	DISPLAY/SW	NURSE	TECH.	MAKER	CONTENTS OF SETTING
MAKER	PARAMETER	DRAINAGE FUNCTION 3-1-3	START	×	×	○	Drainage operation start button
		TEST MODE 3-1-4	FORCED PREP	×	×	○	Forced preparation start button for maker
			FORCED DIALYSIS	×	×	○	Forced dialysate start button for maker
			RINSE AGING	×	×	○	Aging start button for shipping
			CLR	×	×	○	Aging time initialization
	INFORMATION	SOFTWARE VERSION 3-2-1		×	×	○	Display of installed software version
		MACHINE TYPE 3-2-2	HYDRAULIC	×	×	○	Software switch to consistency between software and hardware
			TEMPERATURE SENSOR	×	×	○	Change of temperature sensor type
			BLD	×	×	○	Change of BLD sensor type
			HEATER	×	×	○	Change of heater type
			UFP	×	×	○	Change of UFP encoder type

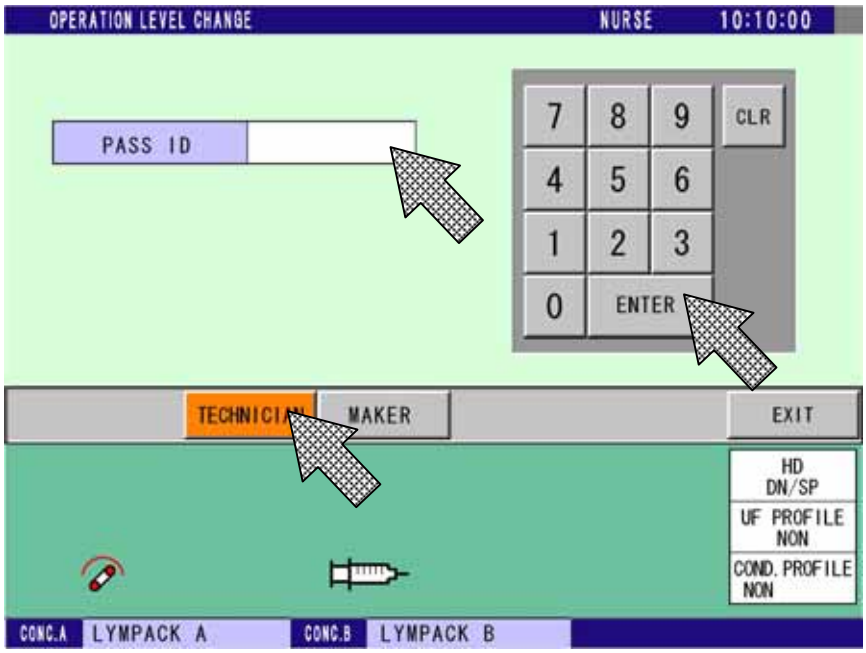
14.4. Rinse Program Setting and Creating Methods

This machine can register 20 rinse program patterns at maximum combining various types of rinse methods.

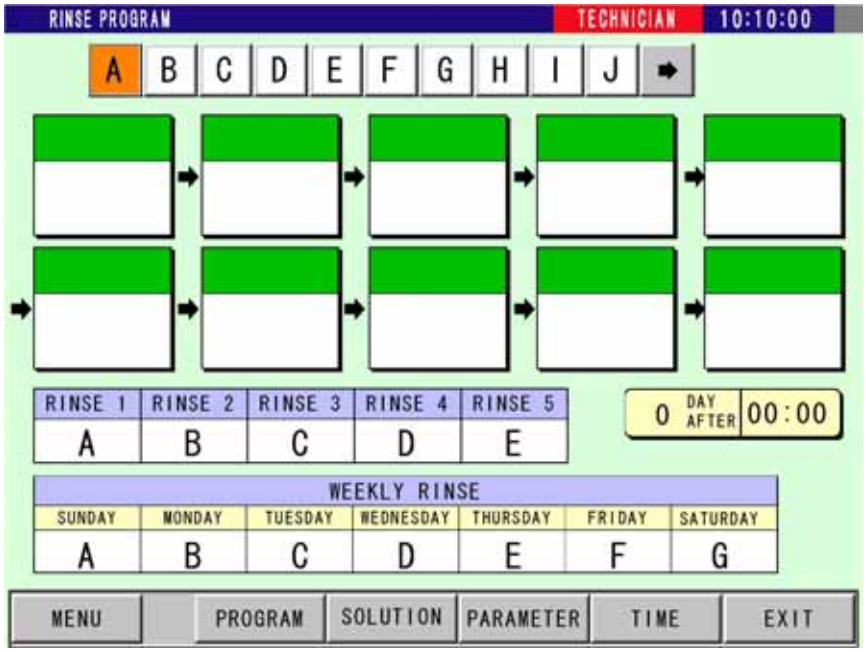
14.4.1. Rinse program creating method

First of all, you have to login in the TECHNICIAN mode to create a rinse program pattern.
The following login screen will be displayed by touching “NURSE” displayed at the upper right in the screen.

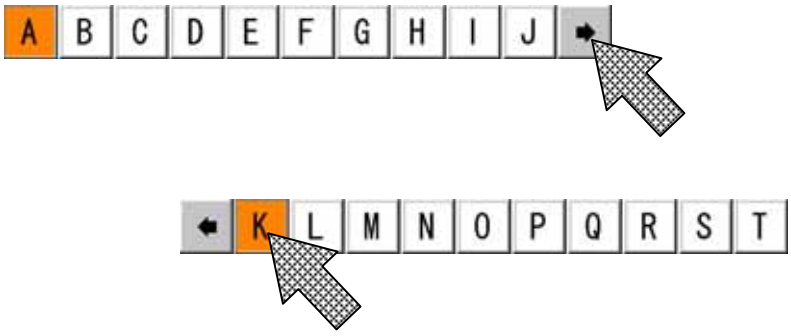
1. Confirm the TECHNICIAN button is in orange. If not, press the button.
2. After touching the empty column at the right of “PASS ID”, input the preset PASS I.D. with the ten keys, and then press the ENTER button.
3. The previous screen is displayed. “NURSE” displayed at the upper right changes into red and the display changes to “TECHNICIAN”.



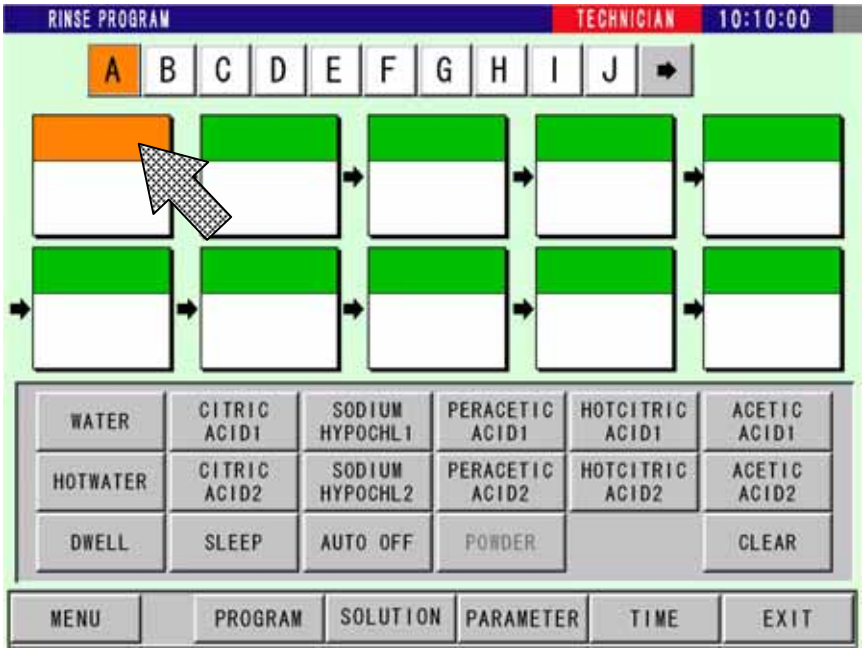
4. Press the MENU button, select the TECHNICIAN tab, and choose RINSE-EDIT-PROGRAM. Then, the following screen will appear.


RINSE PROGRAM
TECHNICIAN
10:10:00
A B C D E F G H I J
RINSE 1 RINSE 2 RINSE 3 RINSE 4 RINSE 5
A B C D E
0 DAY AFTER 00:00
WEEKLY RINSE
SUNDAY MONDAY TUESDAY WEDNESDAY THURSDAY FRIDAY SATURDAY
A B C D E F G
MENU PROGRAM SOLUTION PARAMETER TIME EXIT

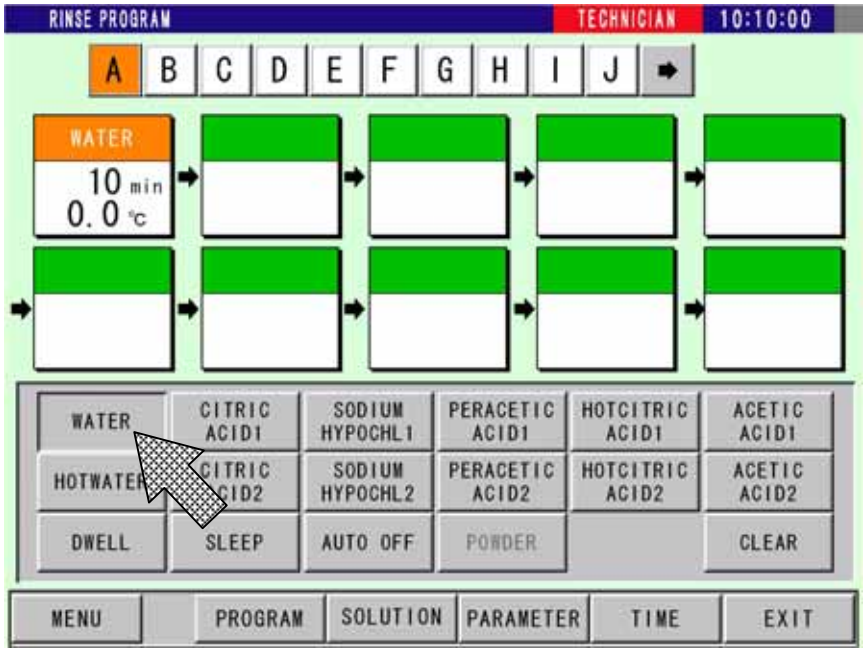
5. 20 rinse program patterns, A through T, can be registered at maximum. Select an alphabet identical to the registration pattern. Pressing the arrow (>) will scroll the alphabets.



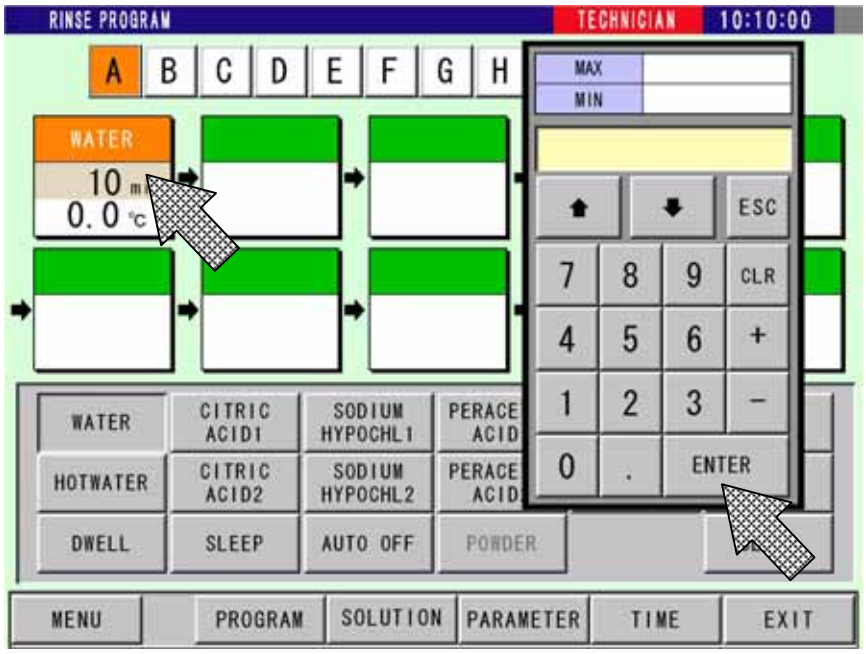
6. Touch the portion shown in the figure below, then the touched portion changes into orange and the buttons for selecting the rinse method will appear at the lower part in the screen. For description of each program item, see 14.4.2 precautions when creating a rinse program and disinfectant settings.



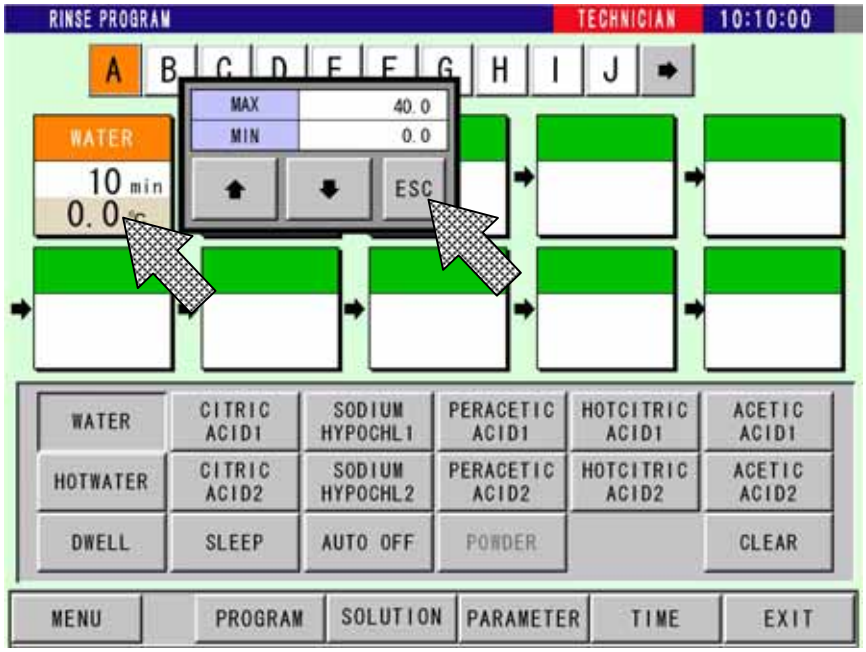
7. Select an intended rinse method, then it will be input as shown in the figure below.



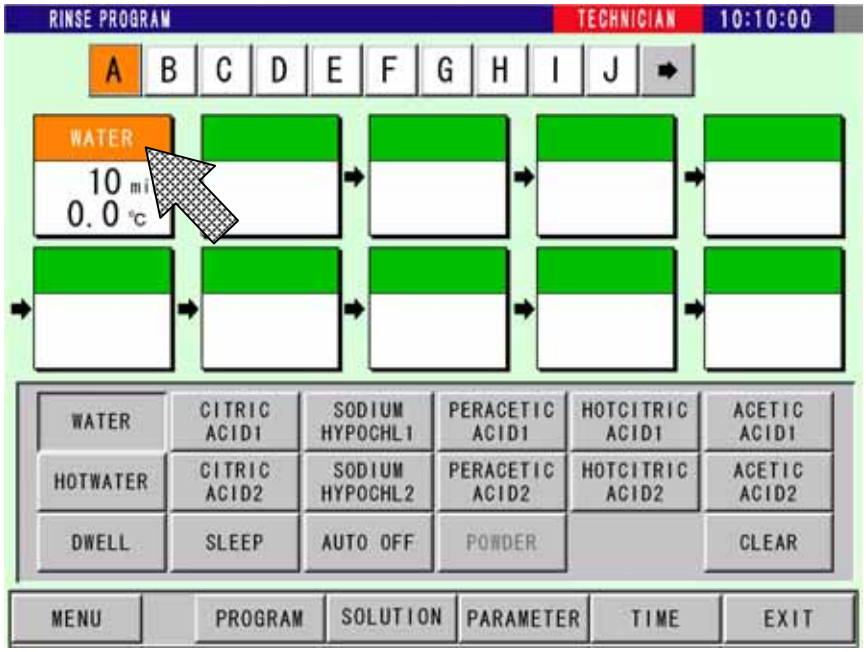
8. Here, input the rinse time for the set rinse as follows. Press the portion pointed by the arrow in the following figure to display the ten keys, then input the rinse time and press the ENTER button. Press the ESC key of the ten keys to return to the original screen.



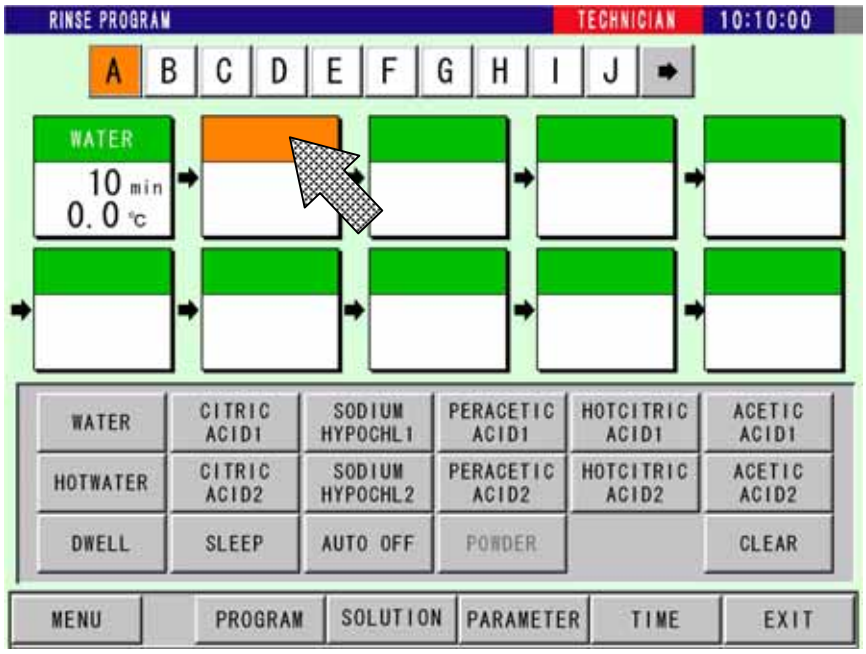
9. Touch the arrow portion in the following figure to display temperature setting keys. Set a temperature using ENTER keys. After entering the temperature, press the ESC key to return to the original screen.



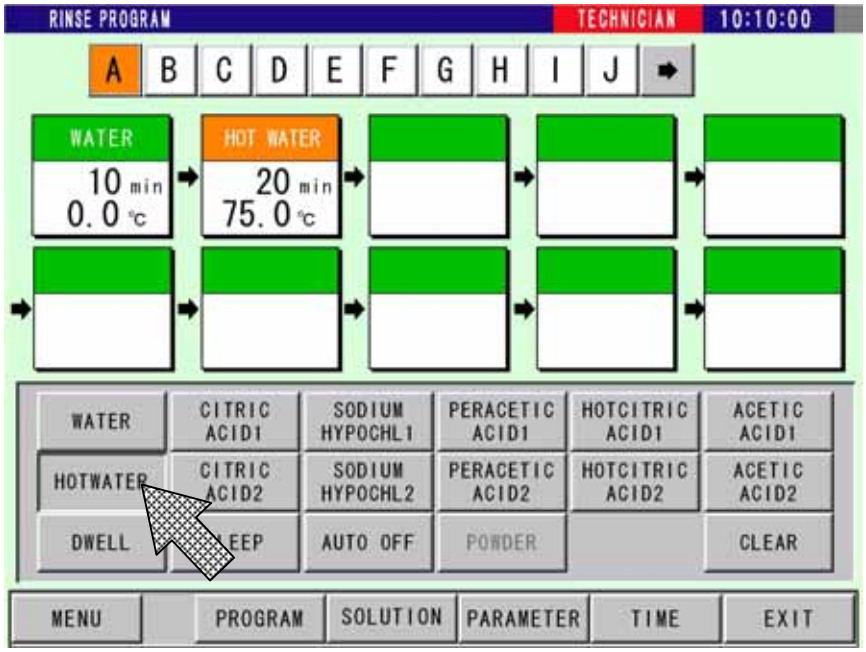
10. Press the rinse selection portion again. The rinse selection button disappears, and it returns to the original screen.



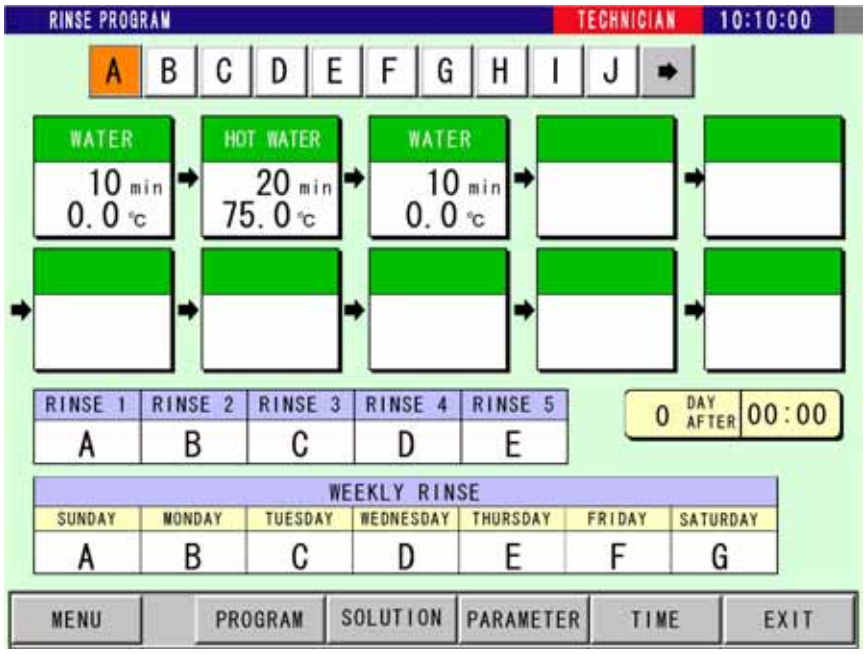
11. You can continue inputting for another rinse method. Touch and select the green portion of the adjacent frame, then the selected portion will change into orange.



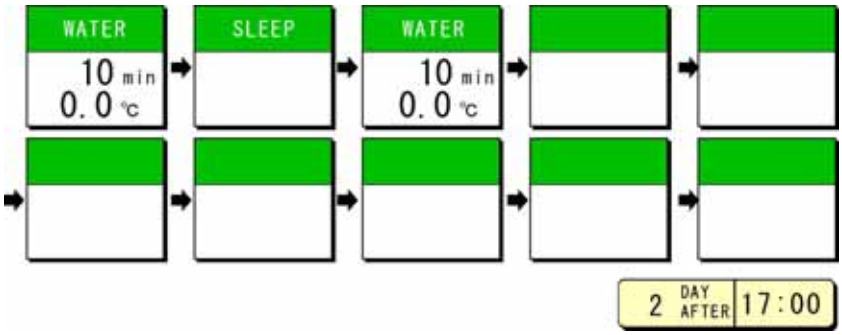
12. Select an intended rinse method and input the rinse time and the set temperature in the manner same as in Step 8. above.



13. Repeat the operations in the steps 6 through 12 to create a rinse program.

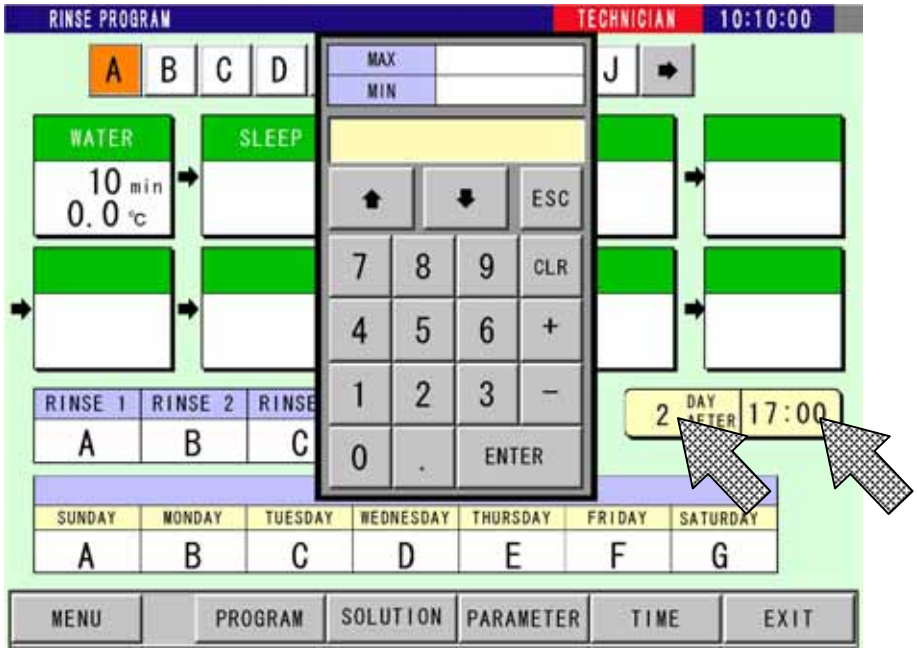


14. By selecting “SLEEP”, you can create a program in which the power supply automatically turns OFF once after rinse is complete and it automatically turns ON again to complete a rinse process at a preset time.

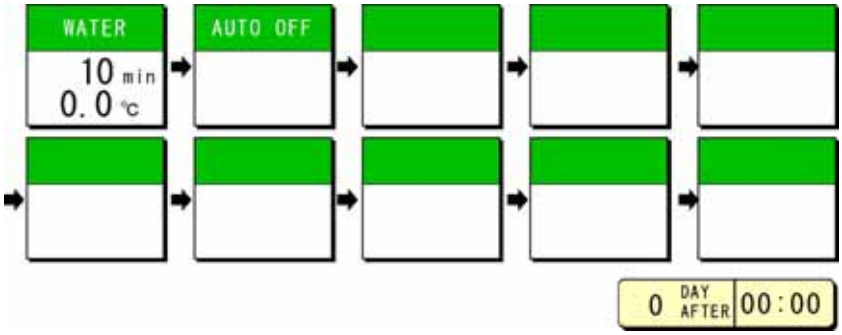


For example, when a rinse program is executed being set as shown in the figure above, the machine automatically starts up so that its power supply turns OFF after a WATER process lasts for 15 minutes and the second rinse process ends at 17:00 2 days after the rinse program is started.

In order to specify the time to finish a rinse process, touch the portion pointed by the arrow in the figure below to display the ten keys, and then set intended date and time to complete the rinse process.



15. Use “AUTO OFF” to set so that the system automatically turns off the power after rinsing.



For instance, if the above setting program is in operation, the system automatically turns off the power after 10 minutes of water rinse.

Repeat the above-mentioned operations to create and register intended numbers of rinse programs.

14.4.2. Notices on creating a rinse program and setting for disinfectant to be used
This dialysis machine allows the selection of the following rinse methods.

Rinse program	Disinfectant to be used	Permitted setting temperature	Usage
WATER	–	0ºC/40ºC	Washes inside of line by clear water for set time.
HOT WATER	–	75-85ºC	Washes inside of line by clear water at temperature controlled to set temperature for set time.
CITRIC ACID	Citric acid	-	Suctions citric acid from disinfectant port, dilutes it, and circulates it for set time.
SOLDIUM HYPOCHLO	Sodium hypochlorite	-	Suctions sodium hypochlorite from disinfectant port, dilutes it, and circulates it inside line for set time.
PERACETIC ACID	Peracetic acid	-	Suctions peracetic acid from disinfectant port, dilutes it, and circulates it inside line for set time.
HOT CITRIC ACID	Citric acid	75-85ºC	Suctions citric acid from disinfectant port, dilutes it, and circulates it at temperature controlled to set temperature for set time.
ACETIC ACID	Acetic acid	-	Suctions acetic acid from disinfectant port, dilutes it, and circulates it inside line only for set time.
DWELL	–	-	Keep inside line soaked for set time.
POWER OFF	–	-	Used to create a program in which power supply is automatically turns OFF once after rinse is completed, it automatically turns ON at specified time, and rinse process starts.

In order to prevent different disinfectants from being mixed at rinse or disinfection performed using disinfectant, the programs with the possibility of mixing disinfectants cannot be used at the same time. You have to follow the restrictions below when creating programs. Take caution not to make any incorrect setting since it will cause an error, stopping the rinse program.

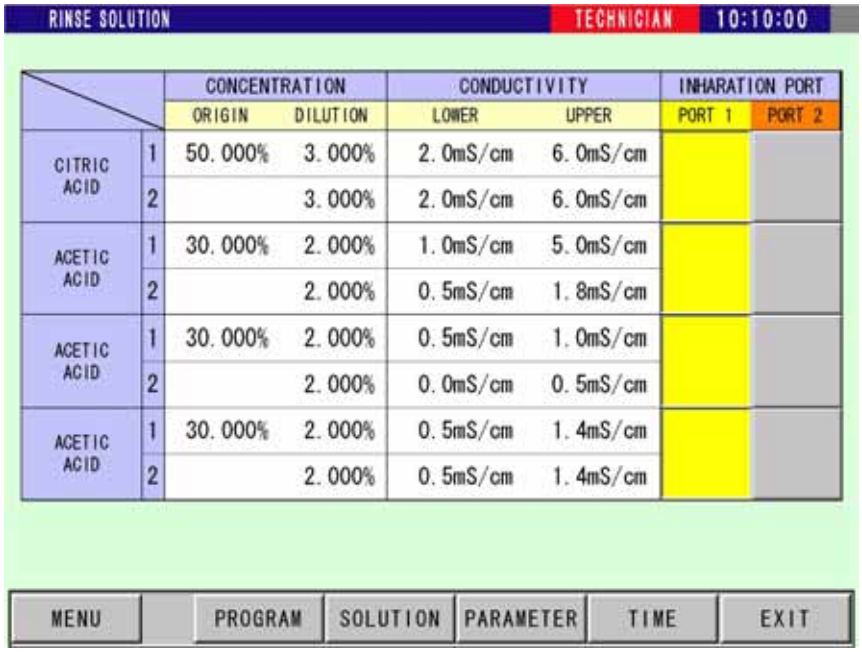
- Set WATER at the beginning and last of the rinse program.
- Set a time longer than the minimum rinse time set in the Rinse Parameter screen (to be described later).
- After setting a rinse program other than WATER, always set WATER for a time longer than the time set in the Rinse Parameter screen.
- Set WATER just before POWER OFF.
- POWER OFF can be used once in one rinse program.

In order to refer to the conditions such as the shortest rinse time, etc., press the MENU button in the

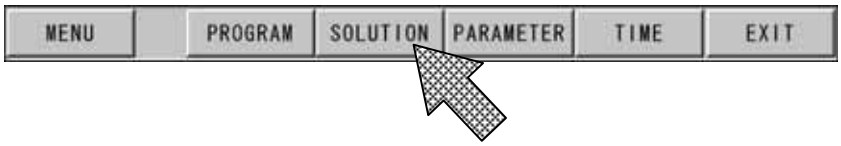
Rinse Standby screen, select the TECHNICIAN tab, and choose RINSE-TIME SETTING. Then, the following screen will appear.

Or, you may press the TIME button at the bottom of the Rinse Program screen to display the same screen.

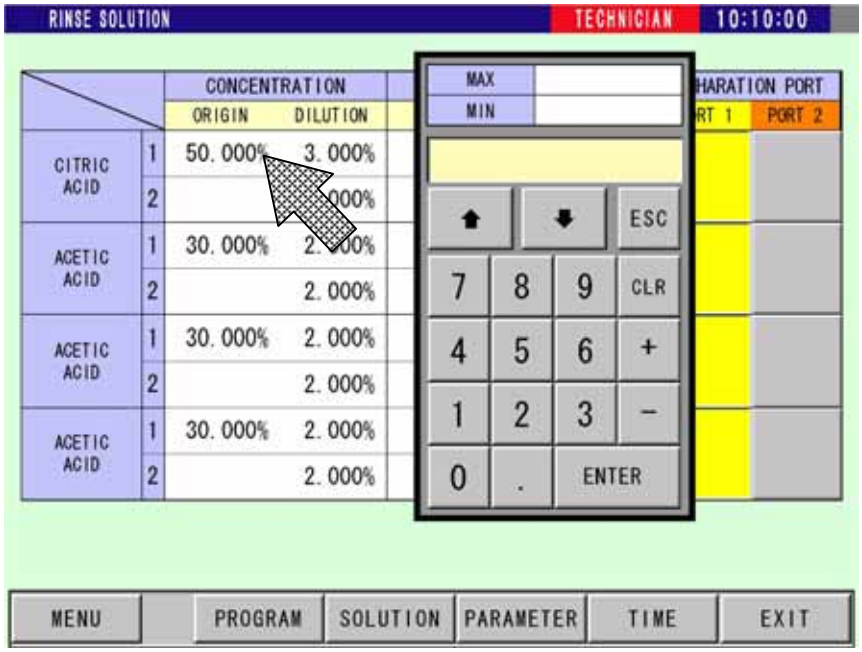
Also, the setting for the dilution ratio of the disinfectant used for disinfection can be done in the Rinse Solution screen. In order to set various kinds of disinfectants to be used for disinfection, press the MENU button in the Rinse Standby screen, select the TECHNICIAN tab, and choose RINSE-SOLUTION SETTING. Then, the following screen will appear.



Or, you may press the SOLUTION button at the bottom of the Rinse Program screen to display the same screen.



The following items can be set in this screen. Touch an intended item to display the ten keys and input a set value.
Two types of concentration settings are possible for each rinse solution.

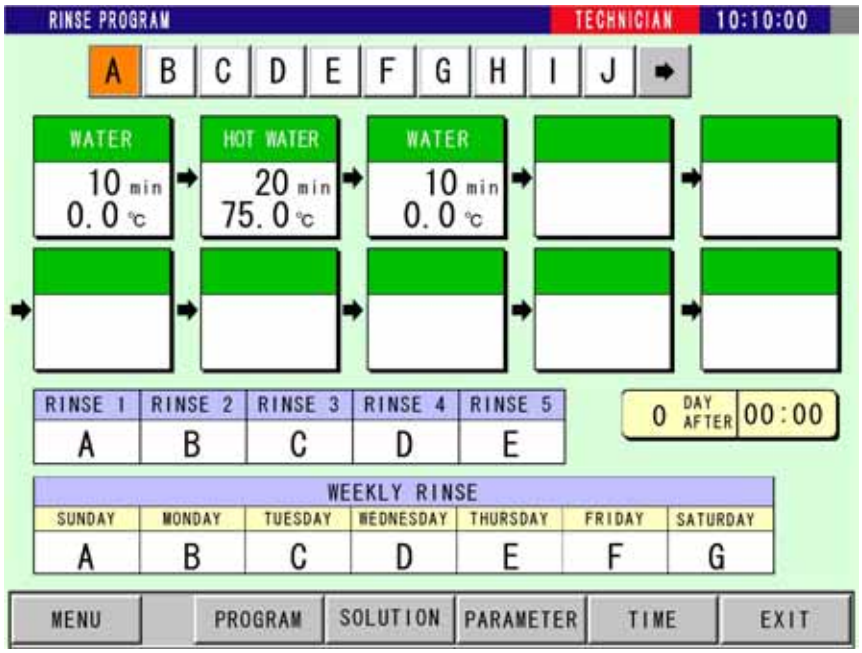


CONCENTRATION	ORIGIN	Sets concentration of disinfectant to be used for rinse and disinfection.
	DILUTION	Sets concentration to which disinfectant to be used is actually diluted for rinse and disinfection
CONDUCTIVITY	LOWER LIMIT	Sets lower limit of disinfectant concentration alarm at rinse and disinfection.
	UPPER LIMIT	Sets upper limit of disinfectant concentration alarm at rinse and disinfection.
INHARATION PORT		Used to distinguish rinse ports depending on kind of disinfectant. Used only when PORT 2 is optionally furnished.

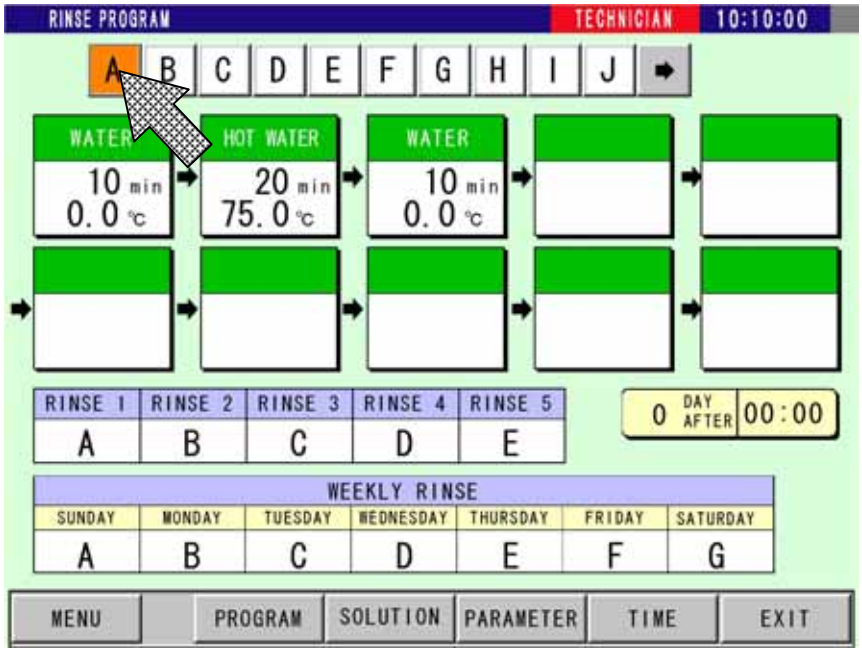
14.4.3. Registering rinse program in Rinse Standby screen

Register the created rinse programs in Rinse Standby screen so that you can select various rinse methods in the NURSE mode.
Five patterns can be registered at maximum in one rinse program.

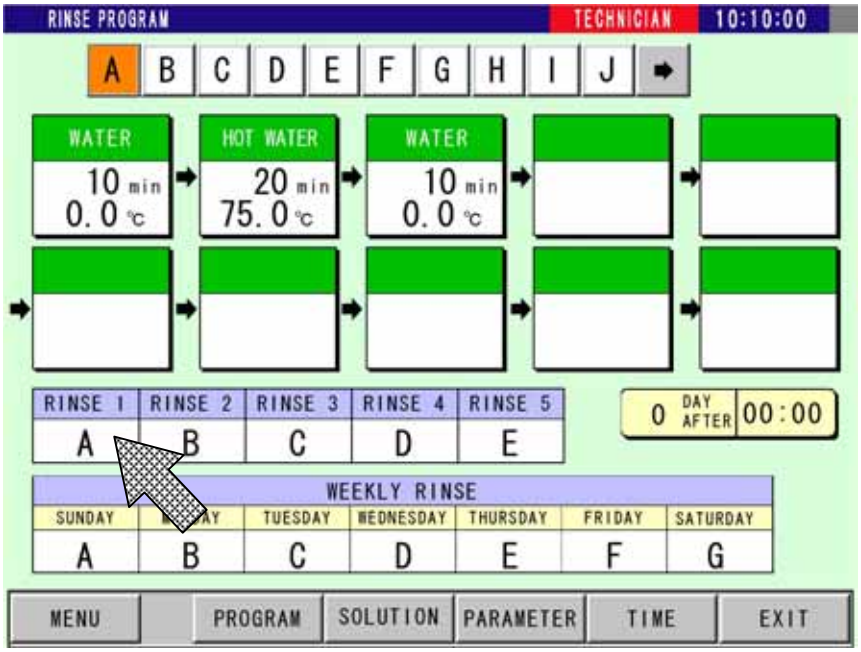
1. Login in the TECHNICIAN mode.
2. Press the MENU button, select the TECHNICIAN tab, and choose RINSE-EDIT PROGRAM. Then, the Rinse Program screen will appear.



3. Select one of the formerly registered rinse programs A through T to display a rinse program to register in the Rinse Standby screen.

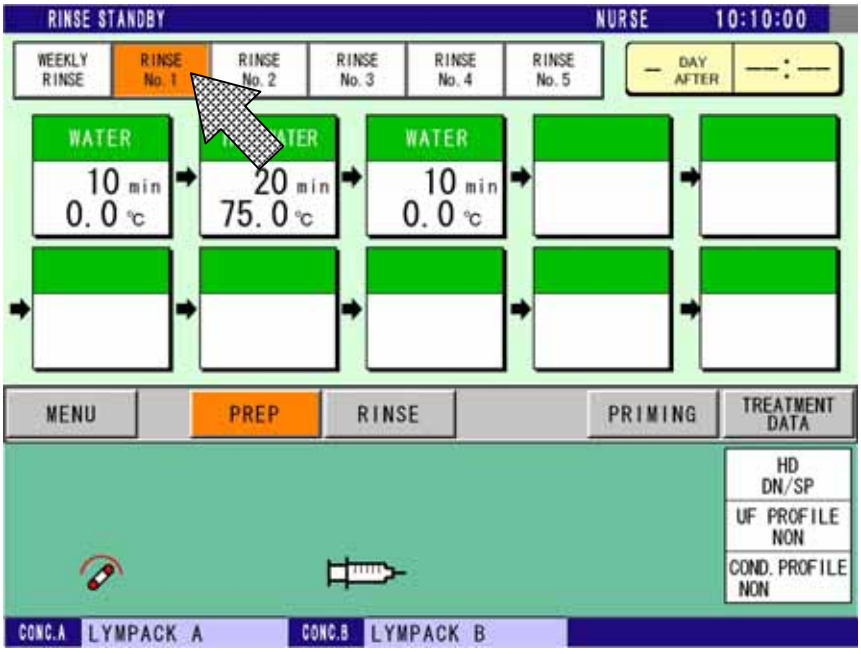


4. Touch an intended alphabet to which you want to register a rinse program. Then, the rinse program displayed at present will be registered.



Set rinse programs No.1-No.5 in the same manner.

The rinse program registered in Step 4. corresponds to the No. pointed by the arrow in the following Rinse Standby screen.

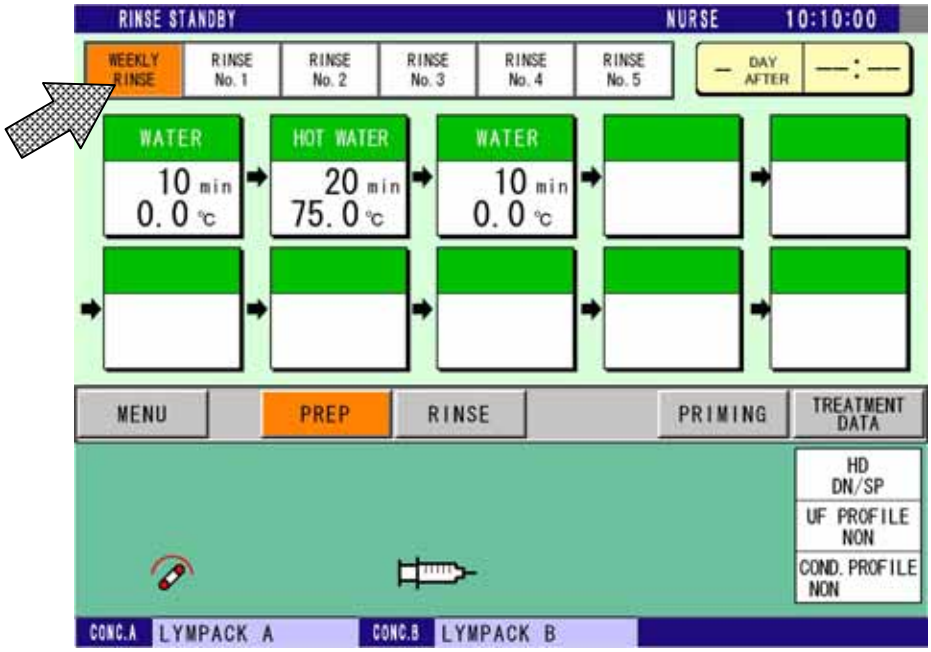


14.4.4. Registering WEEKLY RINSE in Rinse Standby screen

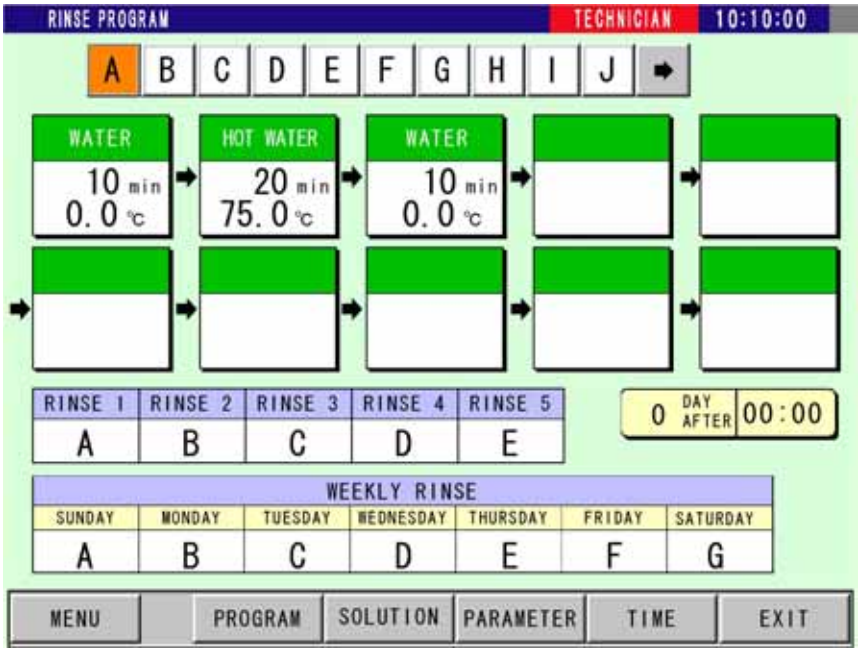
The WEEKLY RINSE button in the Rinse Standby screen will allocate a rinse program to be displayed on each day of a week.

WEEKLY RINSE						
SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
A	B	C	D	E	F	G

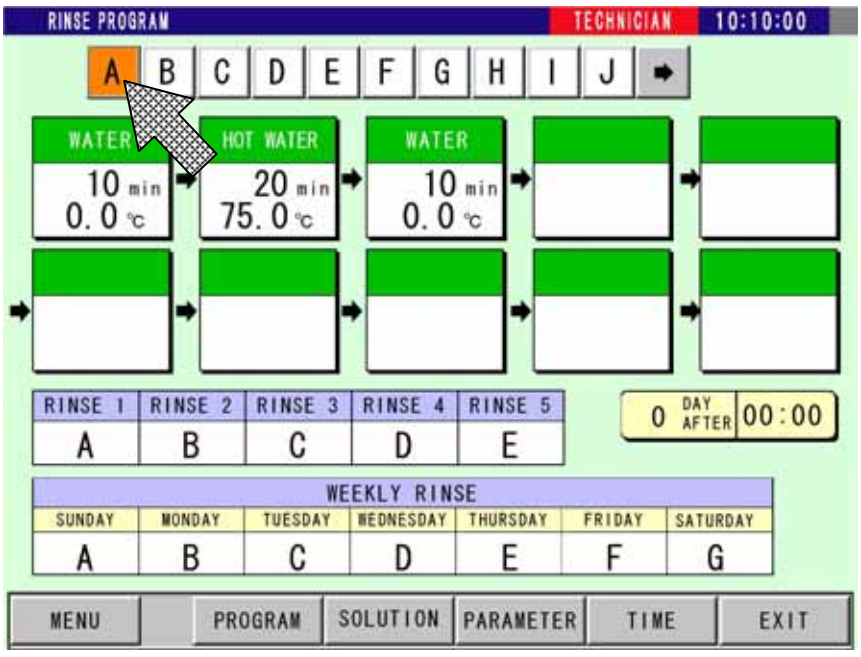
For example, when “WEEKLY RINSE” is set as shown in the above figure, Rinse program A will be displayed when the WEEKLY RINSE button is pressed on Sunday, and Rinse program B when the button is pressed on Monday.



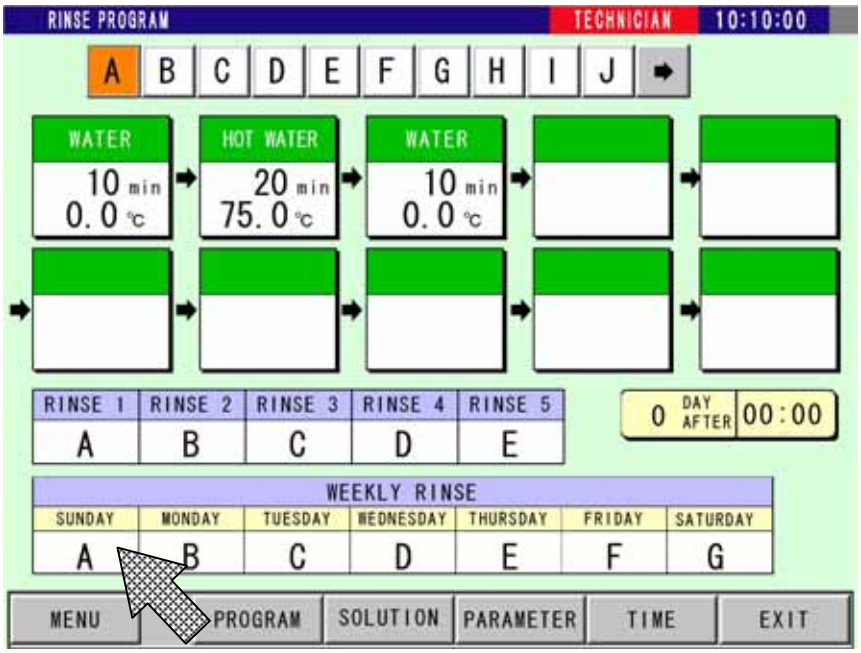
1. Login the TECHNICIAN mode.
2. Press the MENU button, select the TECHNICIAN tab, and choose RINSE-EDIT PROGRAM. Then, the Rinse Program screen will appear.



3. Select one of the formerly registered rinse programs A through T to display a rinse program to register the Rinse Standby screen.

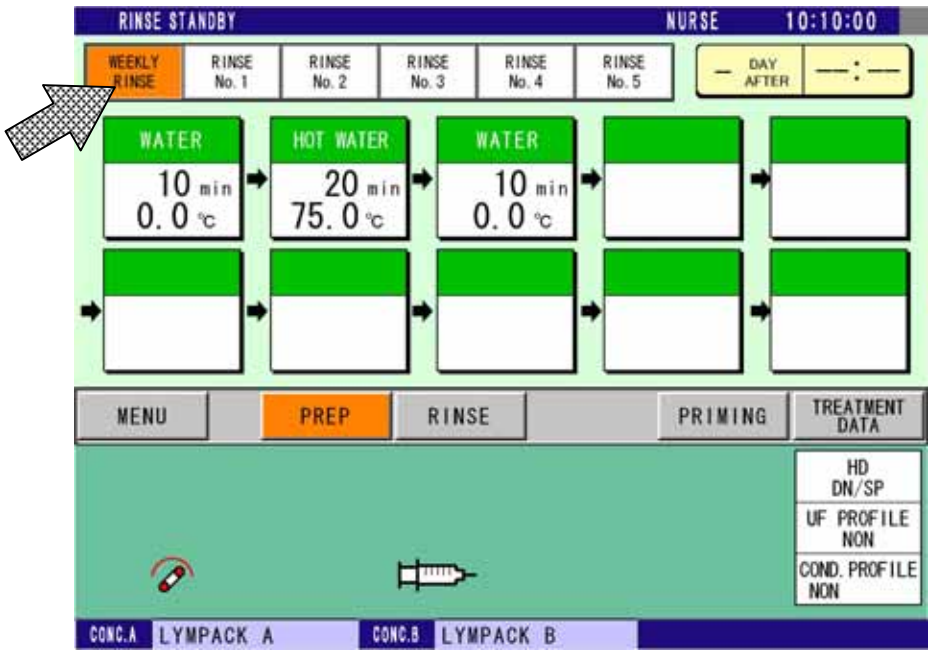


4. Touch an intended alphabet to which you want to register a rinse program. Then, the rinse program being displayed at present will be registered.



Set intended rinse programs to be allocated for one week in the same manner.

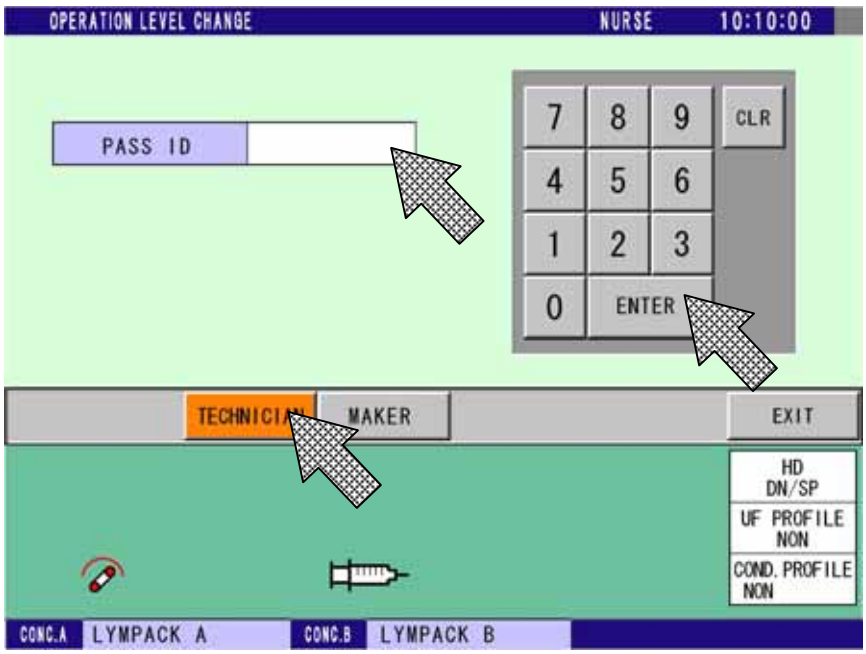
Out of rinse programs registered in Step 4., a rinse program set for each day of a week will be displayed by touching the button pointed by the arrow in the following Rinse Standby screen.



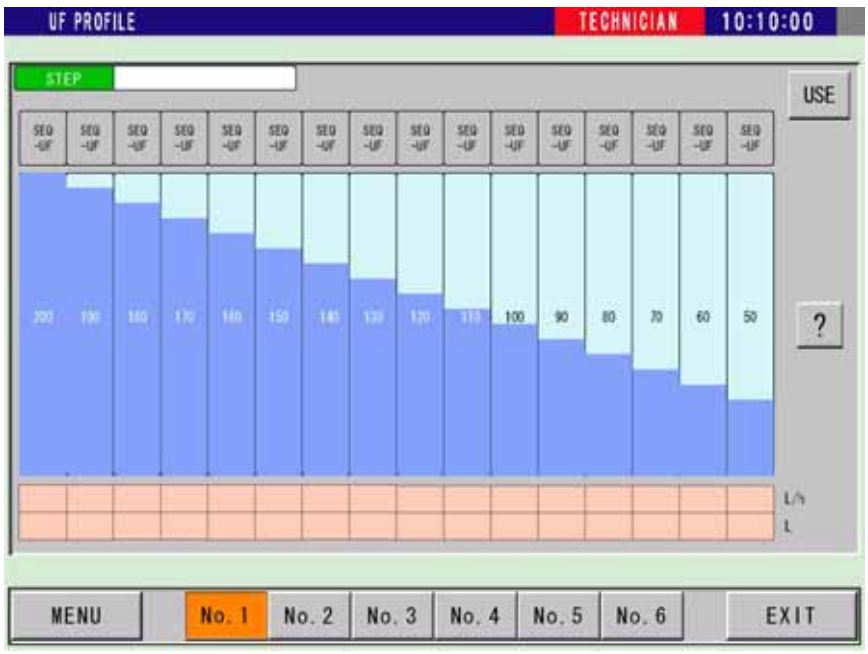
14.5. UF PROFILE Program Creating Method

First of all, you have to login in the TECHNICIAN mode to create an UF PROFILE program.
The following login screen will be displayed by touching “NURSE” displayed at upper right in the screen.

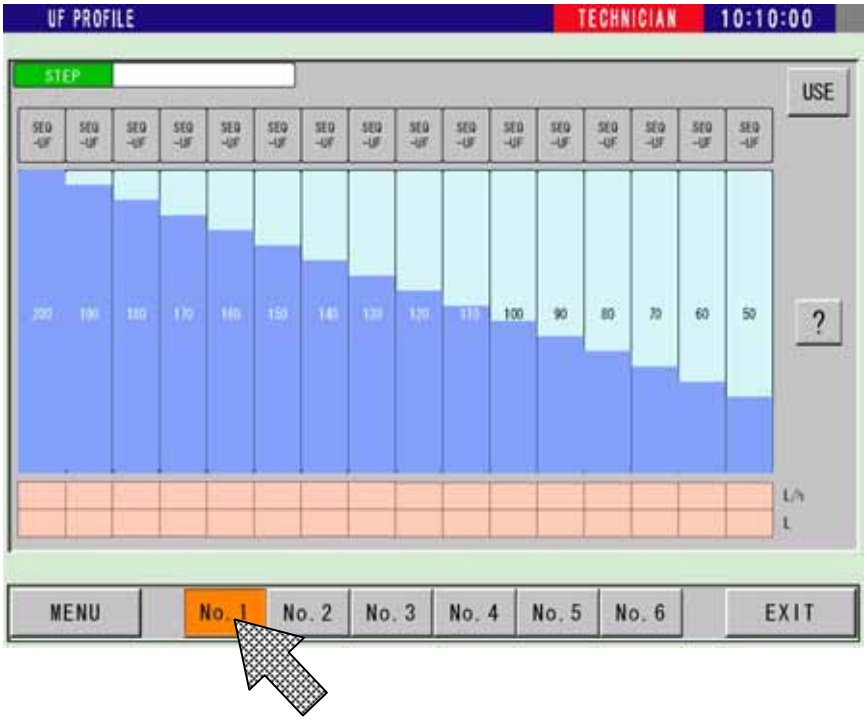
1. Confirm the TECHNICIAN button is in orange. If not, press the TECHNICIAN button.
2. After touching the empty column at the right of “PASS ID”, input the preset PASS I.D. with the ten keys, and then press the ENTER button.
3. The previous screen is restored. “NURSE” displayed at the upper right changes into red and the display changes to “TECHNICIAN”.



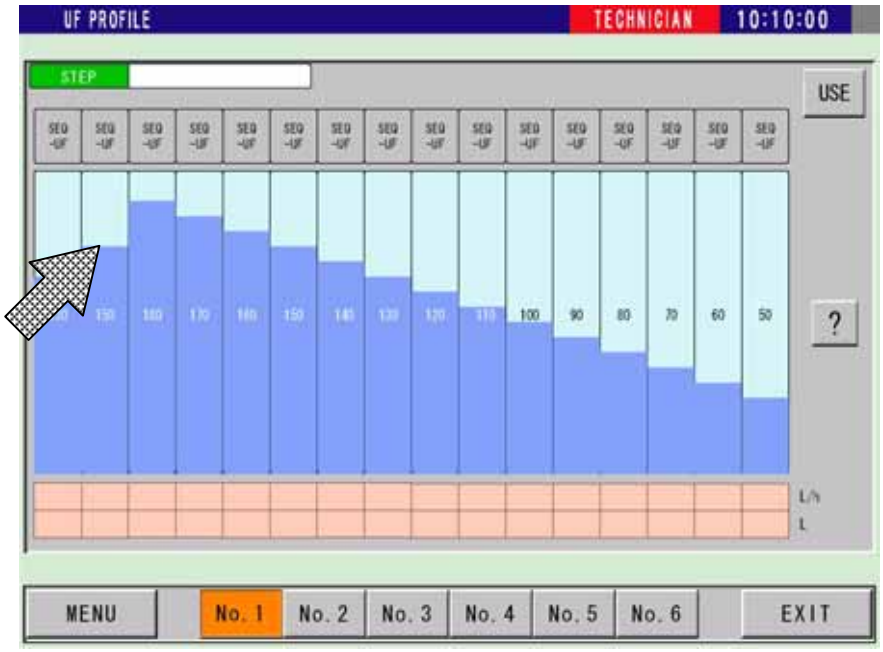
4. Press the MENU button, select the NURSE tab, and choose TREATMENT-UF PROFILE. Then, the following screen will appear.



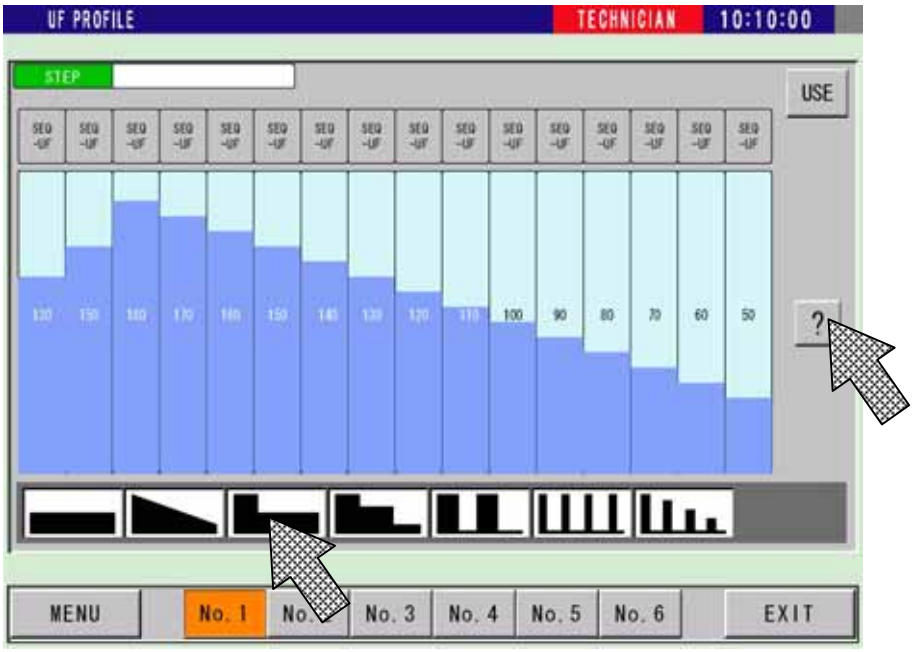
5. Six programs, No.1 through No.6, can be registered at maximum as the UF PROFILE program. Press a button identical to the registration No.



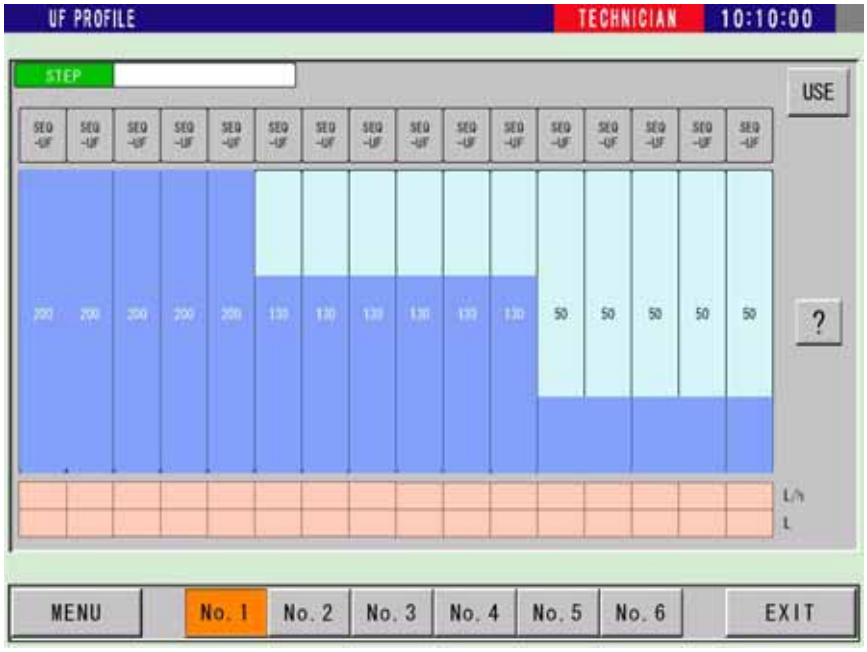
6. Touch the graph directly to create a profile. The UF volume set in dialysis is regarded as 100%, and proportions to the 100% appears in the middle of each slot.



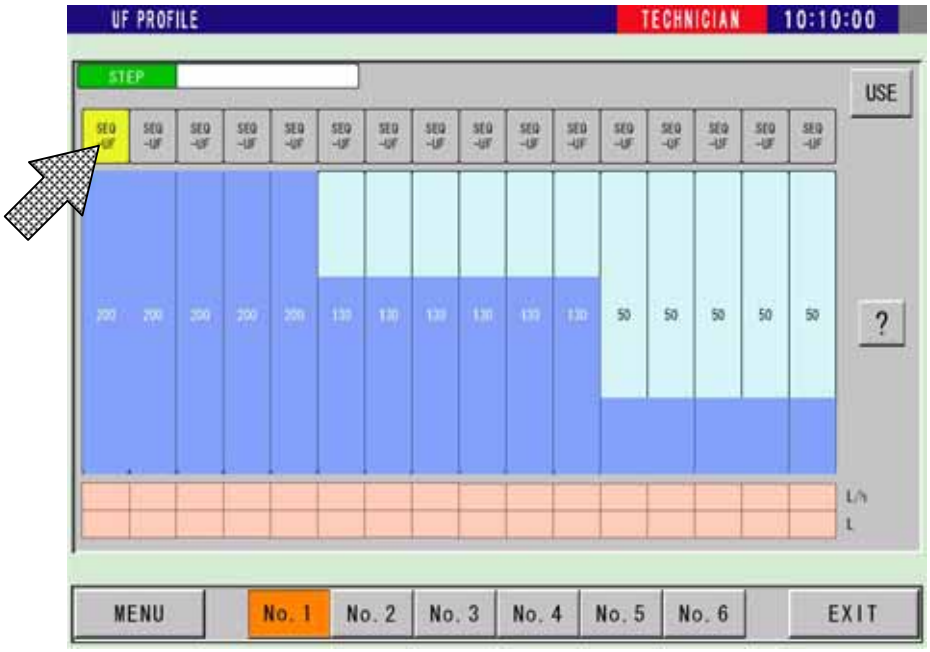
7. Press the mark “?” button on the right side of the screen to display the basic pattern at the bottom of the graph. A profile can be created by pressing the corresponding pattern.



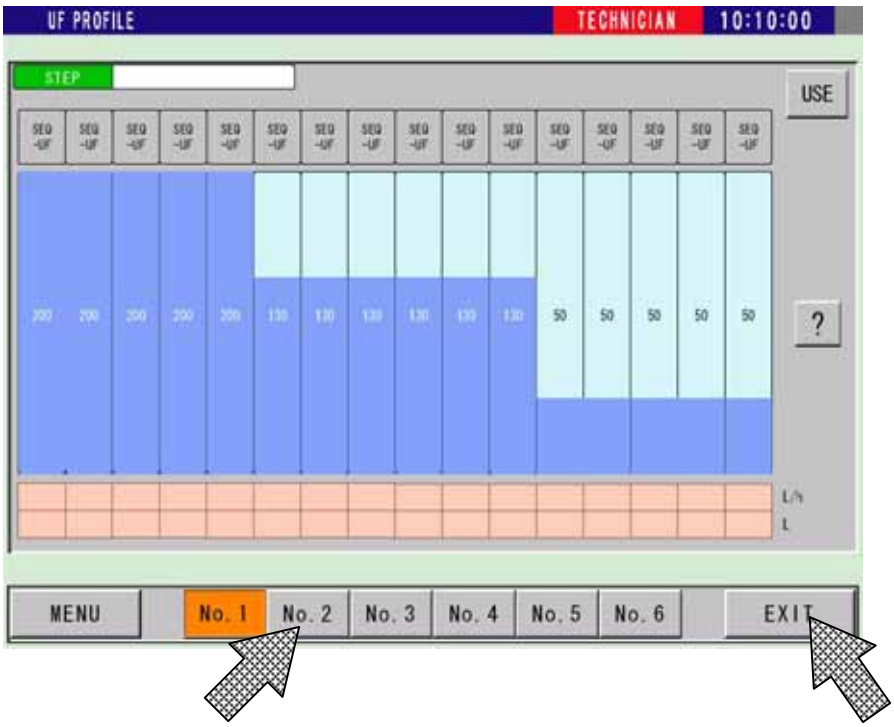
8. Create a profile from No.1 through No. 6 like as below.



9. When the SEQ-UF is pressed, the slot performs sequential UF.



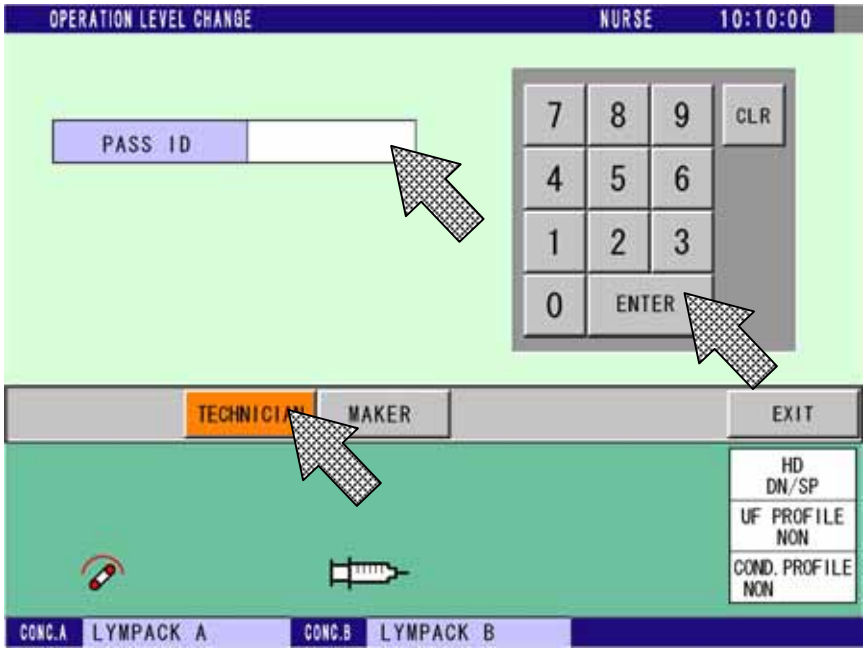
10. Press the EXIT button after all profiles are input. If you want to continue creating other profiles, press an intended profile No. at the bottom of the screen and create the profiles in the manner same as above.



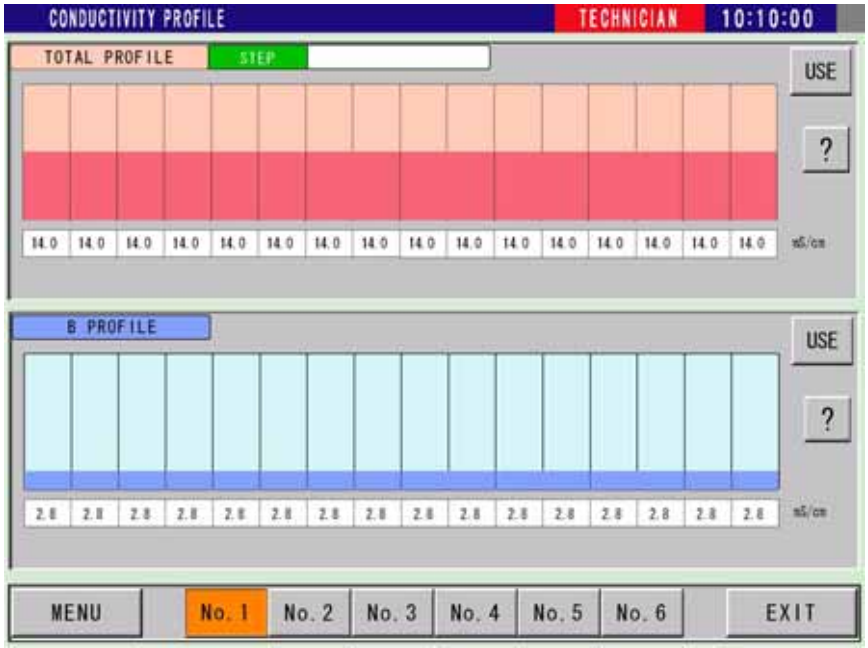
14.6. AB PROFILE Program Creating Method

First of all, you have to login the TECHNICIAN mode to create an AB PROFILE program.
The following login screen will be displayed by touching " NURSE" displayed at upper right in the screen

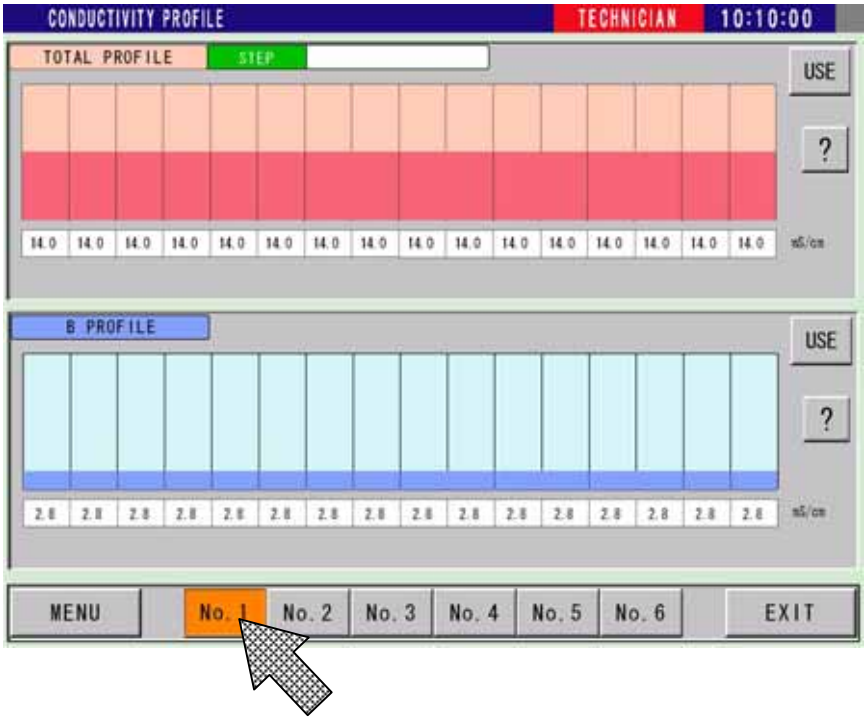
1. Confirm the TECHNICIAN button is in orange. If not, press the TECHNICIAN button.
2. After touching the empty column at the right of "PASS ID", input the preset PASS I.D. with the ten keys, and then press the ENTER button.
3. The former screen is restored. "NURSE" displayed at the upper right changes into red and the display changes to "TECHNICIAN".



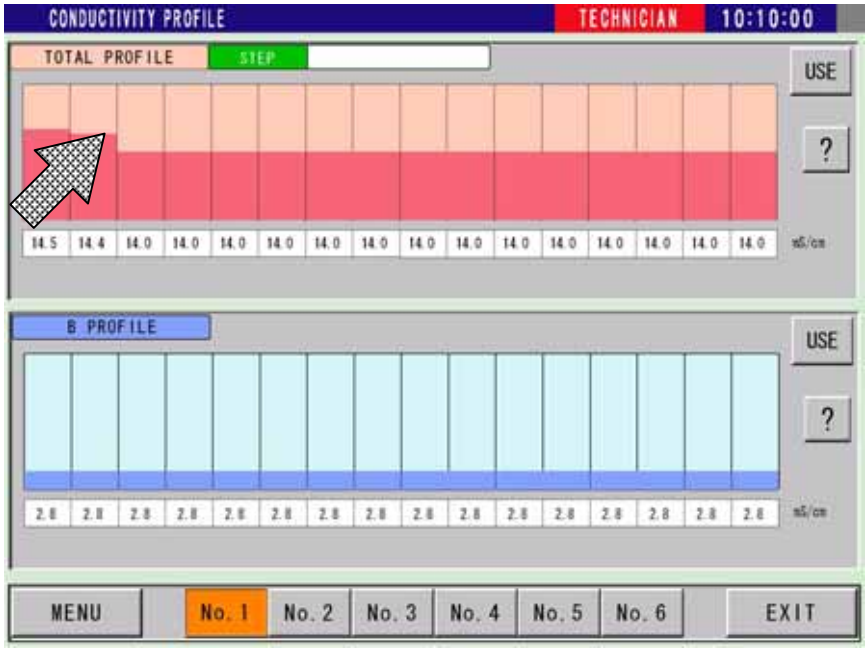
4. Press the MENU button, select the NURSE tab, and choose TREATMENT-AB PROFILE. Then, the following screen will appear.



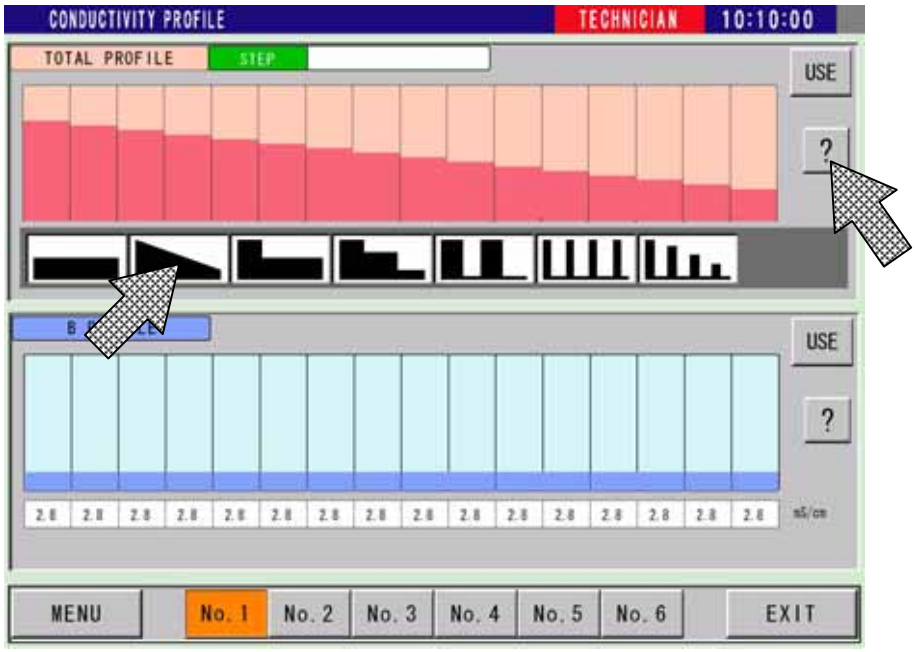
5. Six programs, No.1 through No.6, can be registered at maximum as the AB PROFILE program. Press a button identical to the registration No.



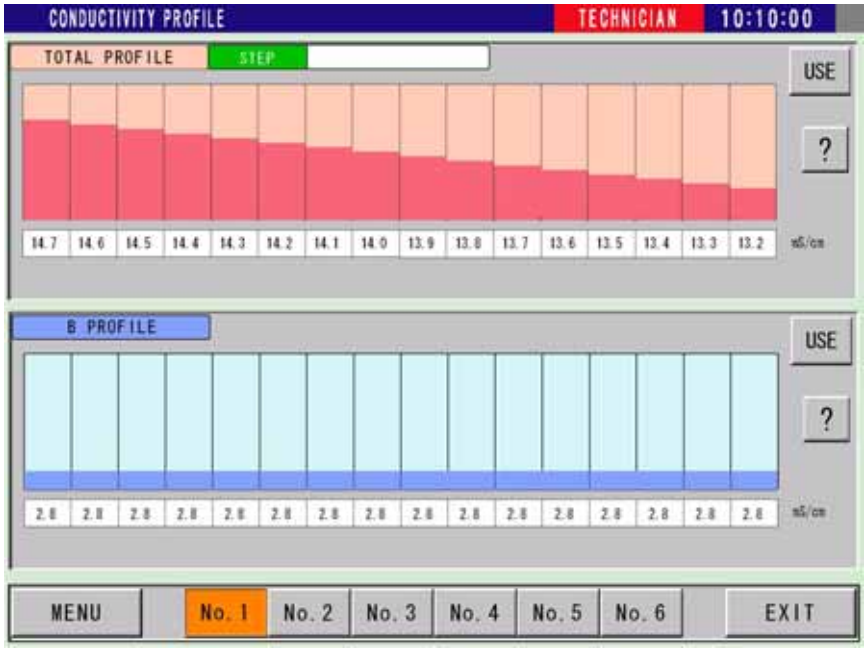
6. Touch the graph directly to create a profile. The solution A can be set within the range of 12.5 mS/cm-15.5 mS/cm. The target conductivity appears below each slot. Use this as a guidance to create a profile.



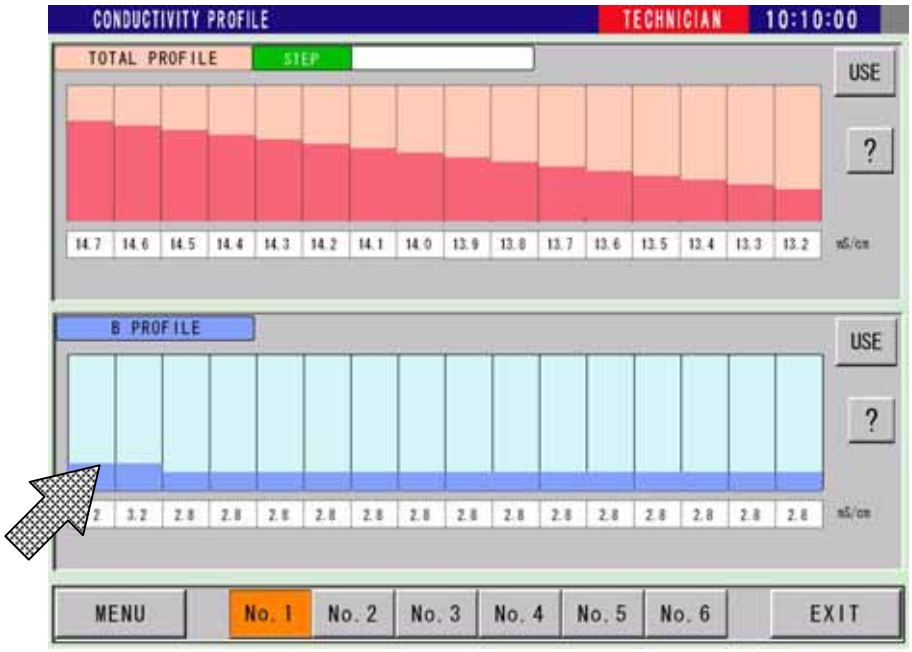
7. Press the mark “?” button on the right side of the screen to display the basic pattern at the bottom of the graph. A profile can be created by pressing the corresponding pattern.



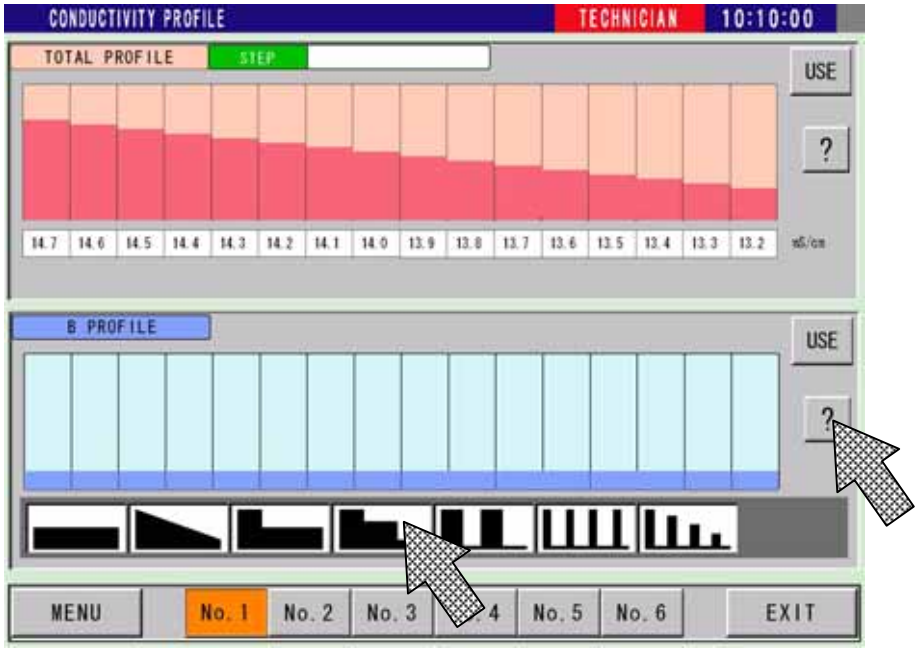
8. Create the concentration profiles for dialysate B according to the procedures same as in step 6.



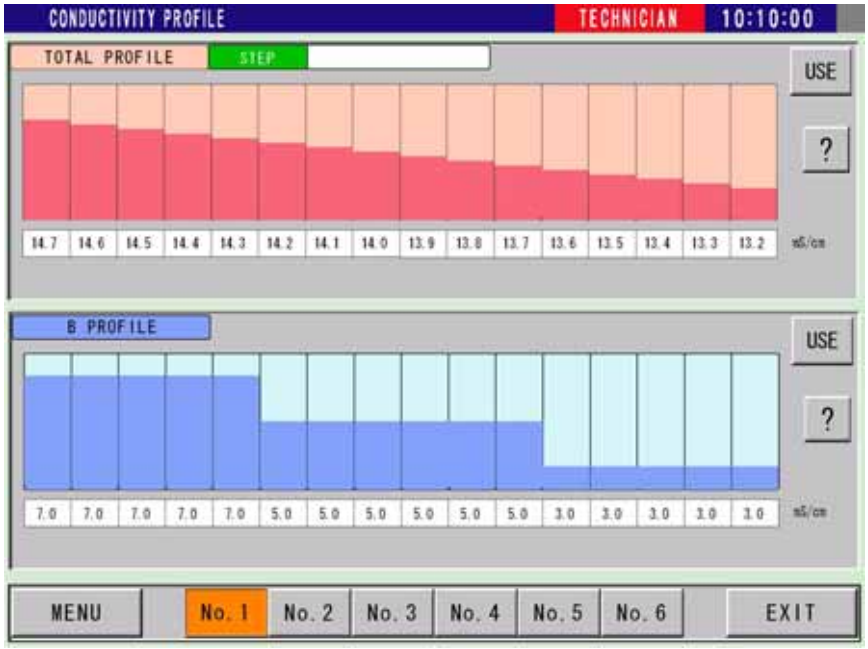
9. Create a concentration profile for dialysate B in the same fashion. Touch the graph directly to create a profile. The solution B can be set within the range of 2.0 mS/cm-8.0 mS/cm. The target conductivity appears below each slot. Use this as a guidance to prepare a profile.



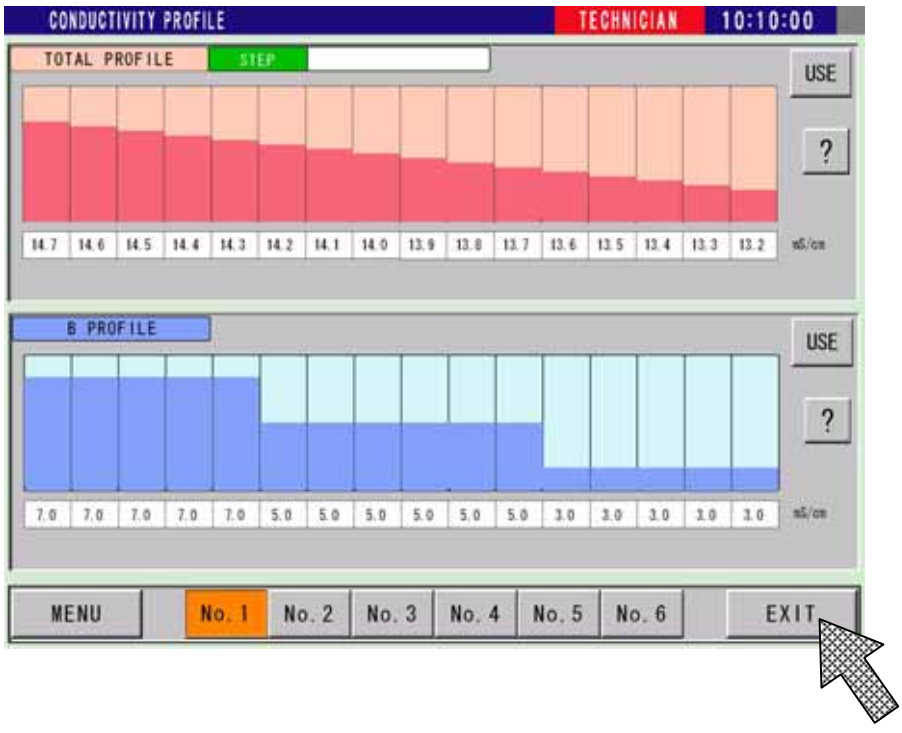
10. Press the mark "?" button on the right side of the screen to display the basic pattern at the bottom of the graph. A profile can be created by pressing the corresponding pattern.



11. Create a necessary profile from No.1 through No. 6 like as below.



12. Press the EXIT button to end this procedure.



15 ADJUSTMENT

15.1. Pressure regulator, Relief Valve

15.1.1. Adjustment of pressure regulator (PR1)

Note) The following procedure is applicable to the reducing valves (Danle Co. Ltd. ER884ZB) equipped with the models from serial No. 03A0001E to No. 04A0207E. Adjustment is not necessary for the valves equipped with the later models. Check the serial No., and follow the procedure.

1. Instruments and tools required
   Calibrated pressure gauge, Hexagon wrench (5 mm), Clamp, tube T-connector

2. Procedure

(1) Remove the back cover of dialysate line section of the machine, open the front door of the machine, and then draw out the dialysate line forward.

(2) Clamp the IN side of V01 with a clamp, and connect a pressure gauge at a position between the clamp and V01.

⚠ CAUTION

Securely clamp the IN side of V01 with a clamp. If clamping is not sufficient, supply water spouts mightily.

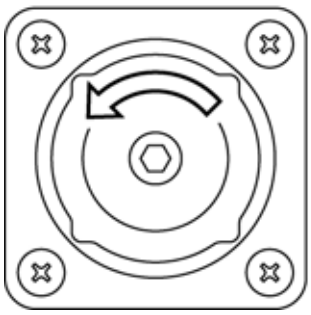
(3) Remove the clamp and turn ON the power supply of the machine.

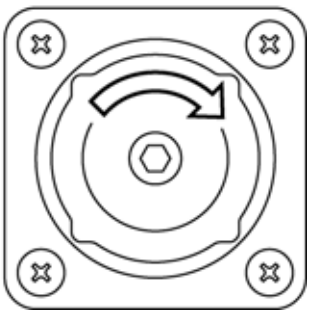
(4) Start PREPARATION at the dialysate flow rate of 500 mL/min.

(5) Press the keys in the order of “MENU”→”NURSE”→”MONITOR”→”LIST MONITOR” to open the List Monitor screen. Find the FS1 indicator.

(6) When FS1 is ON (when the chamber is filling process), read the value of the pressure gauge and adjust pressure to 0.025 ± 0.01 MPa (188 ± 75mmHg) with hexagon wrench. For the adjustment, remove the seal of the reducing valve and turn the adjusting screw with the Hexagon wrench.
The pressure will increase when the screw is turned clockwise (CW) and decrease when turned counterclockwise (CCW).

Turned CCW: Pressure decreases Turned CW: Pressure increases





(7) Press EXIT button to go back to previous screen.

(8) Stop the machine by pressing the RINSE STANBY button, and then detach the pressure gauge.

(8) Install the back cover and close the front door to their normal positions.

Reference)

Adjustment is not necessary for the pressure regulator equipped with the models with serial No. 04A0208E or later. Check the pressure when failure is suspected.

The factory default pressures are show below.

Status of hydraulic line	Regulated pressure (03A0001E to 04A0207E)	Regulated pressure (04A0208E or later)
FS1 ON (with flow)	0.025 ±0.01 MPa （188 ± 75mmHg）	0.030 ± 0.01 MPa (225 ± 75mmHg)
FS1 OFF (without flow)	-	0.040 ± 0.01 MPa (300 ± 75mmHg)

15.1.2. Adjustment of filling completion pressure (RV1)

1. Instruments and tools required
   Calibrated pressure gauge, Clamp, Spanner wrench (23 mm), Spanner wrench (26 mm), tube, T-connector

2. Procedure

(1) Remove the back cover of dialysate line section of the machine.
(2) Clamp the IN side of RV1 with a clamp and connect a pressure gauge at a position between the clamp and RV1.
(3) Remove the clamp. Turn ON the power supply of the machine and enter the TECHNICIAN mode.
(4) Start PREPARATION (without detaching both A/B concentrate nozzles from machine) at the dialysate flow rate of 500 mL/min.

⚠ CAUTION

Before starting PREPARATION, ensure that the clamp is removed.
If the machine is operated with the clamp, the connected tube to the pump may be disconnected, and water may spout.

NOTE

Solution port alarm (0162 SOLUTION A PORT CLOSE, 0163 SOLUTION B PORT CLOSE) may be detected, but ignore these alarms. The PREPARATION program runs in this condition.

(5) Press the keys in the order of “MENU”→”NURSE”→”MONITOR”→”FLOW MONITOR”. Find FS1 indicator.
(6) Press the FORCED OUT button to activate the valves manually.
(7) Press V01 icon **once** to open Valve 01 forcibly, then icon turns green. And press V02 icon **twice** to close Valve 02 forcibly. V02 icon turns gray.
(8) When FS1 is OFF (Chamber is being filled), read the indication value of the pressure gauge and adjust it to 0.120 ± 0.01 MPa (900 ± 75mmHg). Loosen the fixing nut of RV1 and turn the valve body. The pressure will decrease at the time when the valve body is loosen, and will increase when it is tighten.
(9) Tighten the fixing nut after adjustment is complete. Check the filling completion pressure again, because tightening the fixing nut may change the adjusted pressure more or less.
(10) Find P1 indicator and confirm the P1 flow rate is more than 750 mL/min. If the P1 flow rate is out of range, make the adjustment in section 15.1.1 “Adjustment of pressure regulator (PR1)” and then readjust RV1. (Increasing the setting value of PR1, RV1 / P1 flow rate will increase.)
(11) Press EXIT button to go back to previous screen.

(12) Press the RINSE STANDBY button to stop the machine after the adjustment is complete and detaches the pressure gauge.

(13) Install the back cover.

NOTE

After the RV1 calibration, please calibrate dialysate (See 15.7 calibration dialysate).

15.1.3. Adjustment of closed line pressure (RV2) (For software version Ver.04 or later)

This procedure applies to software version Ver.04 or later. Check the software version of your machine and follow the procedure if applicable.

(If you do not know to verify the software version, on the wake-up screen right after the machine turned on.)

1. Instrument and tools required

   Spanner wrench (23 mm), Spanner wrench (26 mm), Dialyzer

2. Procedure

1) Open the front door of the machine and draw out the dialysate line forward.
2) Set the coupler of the machine to the dialyzer.
3) Turn ON the power supply of the machine and enter the TECHNICIAN mode.
4) Press the keys in the order of “MENU”→”TECHNICIAN”→”CALIBRATION”→”DIALYSATE PUMP” to open the DIALYSATE PUMP CALIBRATION screen.
5) Press and hold the CHECK button to start calibration.

NOTE

The machine runs when the CALIBRATION button is pressed, air bubbles may be generated in the closed line and the blood leak alarm occurs. (0111 DIRTY BLOOD LEAK SENSOR) In such a case, continue the adjustment by resetting the alarm with the MUTE button.

6) Run the machine more than 3 minutes. By RV2, P2 rate on the screen becomes 830-880 mL/min.
7) Loosen the fixing nut of RV2 and turn the valve body for adjustment. The flow rate will decrease when the valve body is loosen, and will increase when it is screwed in. P2 RATE on the screen is updated every chamber cycles. Wait for several minutes until the P2 rate becomes stable. After adjustment confirm if the flow rate is within the range of 830-880 mL/min.

NOTE

When the P2 RATE column is red, it means that informs P2 rate is out of the adjustment range. The column turns back to white when the value is within the adjustment range. (830-880 mL/min.)

NOTE

Flow rate is regarded as stable when the difference between the maximum and minimum of recorded flow rate is within 20 mL/min for 2 minutes.

8) Tighten the fixing nut when the adjustment is complete. Check the flow rate in the screen again because tightening of the fixing nut may change the adjusted flow rate.
9) Press and hold the CHECK button to stop the machine.
10) Put the dialysate line into place, and close the front door.

15.2. UF (For software version Ver.04 or later)

This procedure applies to software version Ver.04 or later. Check the software version of your machine and follow the procedure if applicable.
(If you do not know to verify the software version, on the wake-up screen right after the machine turned on.)

15.2.1. ONE−SHOT volume of UF pump calibration.

1. Instruments and tools required.
   Electronic balance, Drainage tube (A tube that can draw from the drainage port to the bucket during measurement), Measurement container (Capacity: approx. 3 L), Bucket (Fill with 5 L of water)

2. Procedure

1) Turn ON the power supply and enter the TECHNICIAN mode.

NOTE

If the Technician did not operate the machine for a few minutes, the machine releases the TECHNICIAN mode automatically. Some items can not operate with NURSE mode, so enter the TECHNICIAN mode again to carry on the machine calibration.

2) Press the keys in the order of “MENU”→”TECHNICIAN”→”CALIBRATION”→”UF PUMP” to open the UF PUMP CALIBRATION screen.
3) Remove the red dialyzer coupler and soak it with 5 L of water in the bucket.
4) Put the drainage tube behind the machine into the bucket.
5) Press and hold the ONE-SHOT button. The ONE-SHOT button turns orange and the priming of the dialysate line starts. Perform the priming more than three minutes for proper calibration.
6) After adequate priming is done, press and hold the ONE-SHOT button to stop priming.
   The button blinks orange.
7) Check the screen to confirm whether the following condition is set. If the numbers are different, press the number to display the ten-key pad and enter the following condition.

ONE SHOT	0.7000 mL
UF RATE	7000 mL/h
TIME LEFT	00:15 (15 min) (※)

※) Entering 0.15 would be displayed as 00:15.

8) Measure the measurement container with an electric balance, and input the gram value of container to START VOLUME column. In this case, throw away a water corrected during priming process in 5).

9) Place the drainage tube into the blank measurement container.

10) Press and hold the ONE-SHOT button, then the button turns yellow and measurement starts. When the setting time passed and the machine completed measurement, the UF pump stops and the button blinks yellow.

NOTE

If the Technician did not operate the machine for a few minutes, the machine releases the TECHNICIAN mode automatically. Some items can not operate with NURSE mode, so enter the TECHNICIAN mode again to carry on the machine calibration.

11) Pull the drainage tube from the measurement container. Measure the measurement container with an electric balance, and input the gram value of container to END VOLUME column.

12) Press and hold the ONE-SHOT button again to automatically calculate ONE-SHOT VOLUME.

13) If the calculated ONE-SHOT VOLUME is not within the range of 0.7000±0.0140, calibrate again.

14) Place the dialyzer coupler and the drainage tube back.

NOTE

If repeated calibration does not allow the calculated ONE-SHOT VOLUME to be within the range, the UF pump needs to be replaced.

15.2.2. UF correction coefficient d calibration

1. Instruments and tools required

Electronic balance, Bloodline (**Including a needle**), Dialyzer, Measurement container (Capacity: approx. 3 L)

2. Procedure

Perform this procedure after " 15.2.1 ONE-SHOT volume of UF pump calibration ".

1) Turn ON the power supply and connect the bloodline and dialyzer to the machine. Then, connect the dialyzer coupler to the dialyzer.
2) Soak the inlet and outlet of the bloodline into the measurement container with approx. 3 L of water. Turn ON the blood pump and prime the bloodline and dialyzer. Air in the dialyzer can be removed smoothly if the blue coupler is facing up.

NOTE

To keep a constant pressure in the vein chamber (PG 5), make a narrow tube around exit of bloodline by a needle, a clamp or etc.

NOTE

To obtain an accurate value, prime the bloodline and dialyzer completely. Be sure to connect a needle on tip of the bloodline.

3) Stop the Blood pump after confirming the bloodline priming enough.
4) Enter the TECHNICIAN mode and press the keys in the order of "MENU"→"TECHNICIAN" →"CALIBRATION"→"UF PUMP" to open the UF PUMP CALIBRATION screen.
5) If the machine has Cut Filter Option, select the SINGLE FILTER tab.

NOTE

If the Technician did not operate the machine for a few minutes, the machine releases the TECHNICIAN mode automatically. Some items can not operate with NURSE mode, so enter the TECHNICIAN mode again to carry on the machine calibration.

6) Confirm that the values in the correction coefficient column on the right side of the screen are a = -0.2000 and d = 0. If these values are different, press the number to display the ten-key pad to change.
7) Press and hold the HD OFFSET button, the button turns orange and the measurement preparation operation starts. At the same time, the dialyzer is being primed. Air in the dialyzer can be removed smoothly if the red coupler is facing up while priming.

8) Run the machine for 5 minutes or longer to stabilize the fluid flowing inside the dialyzer.
9) Press the GRAPH button to display a graph and confirm the pressure PG3 is stable.
10) Press and hold the HD OFFSET button again to stop measurement preparation and the button blinks orange.
11) Put the measurement container with approx. 3 L of water on the electronic balance.

NOTE

Pay attention so that water is not empty and pour water of enough quantity into the container.

12) Read the number on the electronic balance and input the gram value into the START VOLUME column.
13) Press and hold the HD OFFSET button, it turns yellow and measurement starts.
14) When the setting time passes and the machine completes measurement, the UF pump stops and the button blinks yellow.
15) Read the number of the electronic balance, and input the gram value of remained liquid into the END VOLUME column.
16) Press and hold the blinking HD OFFSET button again to calculate correction coefficient d automatically.

NOTE

When d is increased, the actual UF increases against the preset UFR; and when d decreases, the actual UF decreases.

17) If d is not within the range of –60 to +30, readjust the pressure regulator (PR1), filling completion pressure (RV1), closed line pressure (RV2), and calibration of the BP flow rate.

NOTE

The hydraulic line has been running till move out from calibration mode by pressing EXIT button. Please move out from calibration mode to stop the hydraulic line in case you need other operation.

15.2.3. Verification test of UF accuracy

1. Instruments and tools required

   Electronic balance, Bloodline (Including a needle), Dialyzer, Measurement Container (Capacity: approx. 3 L)

2. Procedure

   1) Turn ON the power supply and connect the bloodline and dialyzer to the machine. Then, connect the dialyzer coupler to the dialyzer.
   2) Soak the inlet and outlet of the bloodline into the measurement container with approx. 3 L of water. Turn ON the blood pump and prime the bloodline and dialyzer. Air in the dialyzer can be removed smoothly if the blue coupler is facing up.

NOTE

To obtain an accurate value, prime the bloodline and dialyzer completely. Be sure to connect a needle on tip of the bloodline.

   3) Stop the Blood pump after confirming the bloodline priming enough.
   4) Enter the TECHNICIAN mode and press the keys in the order of “MENU”→”TECHNICIAN” →”CALIBRATION”→”UF PUMP” to open the UF PUMP CALIBRATION screen.

NOTE

If the Technician did not operate the machine for a few minutes, the machine releases the TECHNICIAN mode automatically. Some items can not operate with NURSE mode, so enter the TECHNICIAN mode again to carry on the machine calibration.

   5) Press and hold HD L.CHECK button, then the button turns orange and the measurement preparation operation starts. At the same time, the dialyzer is being primed. Air in the dialyzer can be removed smoothly if the red coupler is facing up.
   6) Run the machine for 5 minutes or longer to stabilize the fluid flowing inside the dialyzer. When air inside the dialyzer is fully removed, turn up the blue coupler.
   7) Press the GRAPH button to display a graph and confirm the pressure PG3 is stable.
   8) Press and hold the HD L.CHECK button again to stop measurement preparation and the button blinks orange.
   9) Put the measurement container with approx. 3 L of water on the electronic balance.

NOTE

Pay attention to that water is not empty and pour water of enough quantity into the container.

10) Read the number on the electronic balance and input the gram value into the START VOLUME column.
11) Press and hold the HD L.CHECK button, it turns yellow and measurement starts. When the setting time passes and the machine completes measurement, the UF pump stops and the button blinks yellow.
12) Read the number of the electronic balance, and input the gram value of remained liquid into the END VOLUME column.
13) Press and hold the blinking HD L.CHECK button again. The value is calculated automatically. When the valve is out of the prescribed range, the valve column of HD L.CHECK is displayed to red.
14) Press and hold HD H.CHECK button, then the button turns orange and the measurement preparation operation starts.
15) Run the machine for 5 minutes or longer to stabilize the fluid flowing inside the dialyzer. When air inside the dialyzer is fully removed, turn up the blue coupler.
16) Press the GRAPH button to display a graph and confirm the pressure PG3 is stable.
17) Press and hold the HD H.CHECK button again to stop measurement preparation and the button blinks orange.
18) Put the measurement container with approx. 3 L of water on the electronic balance.
19) Read the number on the electronic balance and input the gram value into the START VOLUME column.
20) Press and hold the HD H.CHECK button, it turns yellow and measurement starts. When the setting time passes and the machine completes measurement, the UF pump stops and the button blinks yellow.
21) Read the number of the electronic balance, and input the gram value of remained liquid into the END VOLUME column.
22) Press and hold the blinking HD H.CHECK button again. The value is calculated automatically.
23) When the setting values of either ± 30 g/h or ± 1% is met, the machine passed this verification test. When the valve is out of the prescribed range, the number column is displayed to red.

If the calculated value meets the prescribed range ± 30 g/h or ± 1% of setting range, the test is passed. When the value is not out of range that ± 30 g/h or ± 1%of setting value, the value column is displayed to red.

NOTE

If this test does not allow measurement to be within the prescribed range, determine the UF correction coefficient d once again.

Reference：Setting condition at the time of the verification.

	HD L.CHECK	HD H.CHECK
UF RATE	500 mL/h	5000 mL/h
TIME LEFT	00:15　(15 minutes)	00:20　(20 minutes)
BP	200 mL/min	300 mL/min

15.2.4. Decision of UF correction coefficient d' (For SEQ-UF)

1. Instruments and tools required

   Electronic balance, Bloodline (Including a needle), Dialyzer, Measurement container (Capacity: approx. 3 L)

2. Procedure

Perform this procedure after calibration of UF pump and ONE-SHOT flow rate.

1) Turn ON the power supply and connect the bloodline and dialyzer to the machine. Then, connect the dialyzer coupler to the dialyzer.
2) Soak the inlet and outlet of the bloodline into the measurement container with approx. 3 L of water. Turn ON the blood pump and prime the bloodline and dialyzer. Air in the dialyzer can be removed smoothly if the blue coupler is facing up.

NOTE

To keep a constant pressure in the vein chamber (PG 5), make a narrow tube around exit of bloodline by a needle, a clamp or etc.

NOTE

To obtain an accurate value, prime the bloodline and dialyzer completely. Be sure to connect a needle on tip of the bloodline.

3) Stop the blood pump after enough priming.
4) Enter the TECHNICIAN mode and press the keys in the order of "MENU"→"TECHNICIAN"→"CALIBRATION"→"UF PUMP" to open the UF PUMP CALIBRATION screen.

NOTE

If the Technician did not operate the machine for a few minutes, the machine releases the TECHNICIAN mode automatically. Some items cannot operate with NURSE mode, so enter the TECHNICIAN mode again to carry on the machine calibration.

5) Confirm that the values in the correction coefficient column on the right side of the screen are a = -0.2000 and d' = 0. If these values are different, press the number to display the ten-key pad to change.

NOTE

If the machine has Cut Filter Option, select the SINGLE FILTER tab.

6) Press and hold the SEQ OFFSET button, the button turns orange and the measurement preparation operation starts. At the same time, the dialyzer is being primed. Air in the dialyzer can be removed smoothly if the red coupler is facing up while priming.
7) Run the machine for 5 minutes or longer to stabilize the fluid flowing inside the dialyzer.
8) Press the GRAPH button to display a graph and confirm the pressure PG3 is stable.
9) Press and hold the SEQ OFFSET button again to stop measurement preparation.
10) Put the measurement container with approx. 3 L of water on the electronic balance.
11) Read the number on the electronic balance and input the gram value into the START VOLUME column.

NOTE

Pay attention to that water is not empty and pour water of enough quantity into the container.

12) Press and hold the SEQ OFFSET button, it turns yellow and measurement starts.
13) When the setting time passes and the machine completes measurement, the UF pump stops and the button blinks yellow.
14) Read the number of the electronic balance, and input the gram value of remained liquid into the END VOLUME column
15) Press and hold the blinking SEQ OFFSET button again to calculate correction coefficient d' automatically.

NOTE

When d is increased, the actual UF increases against the preset UFR; and when d decreases, the actual UF decreases.

16) If d is not within the range of 25 to 85, readjust the pressure regulator (PR1), filling completion pressure (RV1), closed line pressure (RV2), and calibration of the BP flow rate.

NOTE

The hydraulic line has been running till move out from calibration mode by pressing EXIT button. Please move out from calibration mode to stop the hydraulic line in case you need other operation.

15.2.5. Verification test of UF accuracy (For SEQ-UF)

1. Instruments and tools required

Electronic balance, Bloodline (Including a needle), Dialyzer, Measurement Container (Capacity: approx. 3 L)

2. Procedure

1) Turn ON the power supply and connect the bloodline and dialyzer to the machine. Then, connect the dialyzer coupler to the dialyzer.
2) Soak the inlet and outlet of the bloodline into the measurement container with approx. 3 L of water. Turn ON the blood pump and prime the bloodline and dialyzer. Air in the dialyzer can be removed smoothly if the blue coupler is facing up.

NOTE

To obtain an accurate value, prime the bloodline and dialyzer thoroughly. Be sure to connect a needle on tip of the bloodline.

3) Stop the blood pump after enough priming.
4) Enter the TECHNICIAN mode and press the keys in the order of "MENU"→"TECHNICIAN" →"CALIBRATION"→"UF PUMP" to open the UF PUMP CALIBRATION screen.

NOTE

If the Technician did not operate the machine for a few minutes, the machine releases the TECHNICIAN mode automatically. Some items can not operate with NURSE mode, so enter the TECHNICIAN mode again to carry on the machine calibration.

5) Press and hold SEQ CHECK button, then the button turns orange and the measurement preparation operation starts. At the same time, the dialyzer is being primed. Air in the dialyzer can be removed smoothly if the red coupler is facing up.
6) Run the machine for 5 minutes or longer to stabilize the fluid flowing inside the dialyzer. When air inside the dialyzer is fully removed, turn up the blue coupler.
7) Press the GRAPH button to display a graph and confirm the pressure PG3 is stable.
8) Press and hold the SEQ CHECK button again to stop measurement preparation and the button blinks orange.
9) Put the measurement container with approx. 3 L of water on the electronic balance.
10) Read the number on the electronic balance and input the gram value into the START VOLUME column.

NOTE

Pay attention so that water is not empty and pour water of enough quantity into the container.

11) Press and hold the SEQ CHECK button, it turns yellow and measurement starts. When the setting time passes and the machine completes measurement, the UF pump stops and the button blinks yellow.
12) Read the number on the electronic balance and enter the dialysate gram value discharged in the END VOLUME column.
13) Press and hold the blinking SEQ CHECK button again. The value is calculated automatically. When the number is out of the prescribed range, the number column of SEQ CHECK is displayed to red.

If the calculated value meets the prescribed range ± 30 g/h or ± 1% of setting range, the test is passed. When the value is not out of range that ± 30 g/h or ± 1%of setting value, the value column is displayed to red.

NOTE

If this test does not allow measurement to be within the prescribed range, determine the UF correction coefficient d' once again.

Reference：Setting condition at the time of the verification.

UF RATE	1000 mL/h
TIME LEFT	00:15 (15 minutes)
BP	200 mL/min

15.3. Sensors (For software version Ver.04 or later)

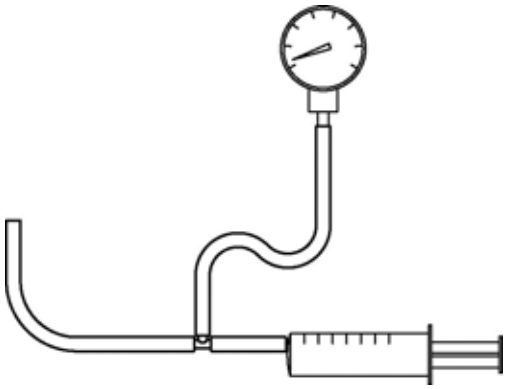
This procedure applies to software version Ver.04 or later. Check the software version of your machine and follow the procedure if applicable.

(If you do not know to verify the software version, on the wake-up screen right after the machine turned on.)

15.3.1. Dialysate pressure sensor （PG3）calibration

1. Instruments and tools required

   Calibrated pressure gauge, Equipment to apply air pressure such as syringe, tube, T-connector, clamps



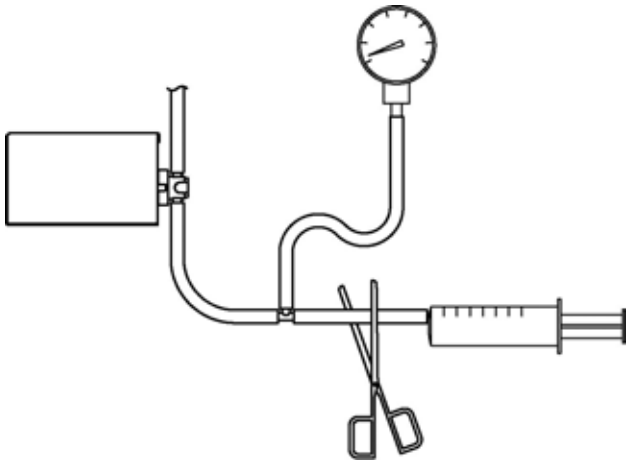
(Ex) Equipment to apply

2. Procedure

2-1. Calibration

1) Open the front door and clamp on the upper tube that is connected to the dialysate pressure sensor. Disconnect the lower tube to leave the sensor in the atmospheric pressure.(Zero pressure)
2) Turn ON the power supply and enter the TECHNICIAN mode.
3) Press the keys in the order of “MENU”→”TECHNITIAN”→”CALIBRATION”→”PRESSURE” to display the PRESSURE CALIBRATION screen.
4) Press the PG3 below the camera icon to turns it to orange.
5) Confirm that LOW POINT is 0 mmHg and HI POINT is 735 mmHg. If these values are different, touch the number and input correct values by ten-key pad.
6) Press and hold the CLEAR button at the bottom of the screen to reset the COEFFICIENT value.
7) When the LOW POINT button is pressed, the button turns yellow and the countdown of the TIME LEFT starts. In the meantime, the machine records the data at atmospheric pressure.
8) Connect the calibration equipment to the opened connector of the pressure sensor.

9) By the syringe, to apply air pressure at 735mmHg to the pressure sensor. Read the pressure though standard pressure gauge and adjust it at 735mmHg. Clamp the tube between syringe and T-connector to hold the pressure (see figure on right).



Blockage of tube

10) When the HI POINT button is pressed, it turns yellow and TIME LEFT starts countdown. In the meantime, the machine records the data at 735mmHg.

11) When TIME LEFT becomes 0 and data recording is complete, the CALCULATE button appears. Press and hold this button. COEFFICIENT value is calculated and displayed based on the data.

12) Press the PG3 colored orange to turn to blue again to turn off the orange.

2-2 Confirmation after calibration

1) Disconnect the calibration equipment. Confirm the PG3 VALUE is within 0±5 mmHg under the atmospheric pressure condition.

2) Reconnect the calibration equipment, pressurize around 700 mmHg and clamp. Confirm the PG3 VALUE is within the displayed value ±5 mmHg of the standard pressure gauge.

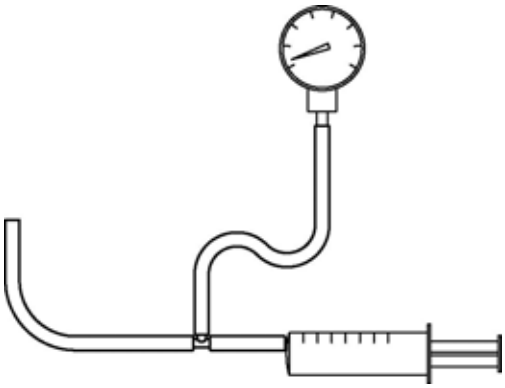
3) If the result of step 1) or 2), or both one failed, recalibrate the sensor.

4) If results are passed, press the EXIT button to exit from the calibration screen and turn off the power supply. Remove the calibration equipment and reconnect the tube to the original position.

15.3.2. Arterial (PG4a)/Venous (PG5) Pressure Sensor Calibration (For software version Ver.04 or later)

This procedure applies to software version Ver.04 or later. Check the software version of your machine and follow the procedure if applicable.

(If you do not know to verify the software version, on the wake-up screen right after the machine turned on.)



(Ex) Equipment to apply

1. Instrument and tools required

   Calibrated pressure gauge, Equipment to apply air pressure such as syringe, tube, T-connector, clamps

2. Procedure

2-1 Offset calibration

1) Confirm both arterial pressure1 (PG4a) and venous (PG5) connection ports are open.
2) Turn ON the power supply and enter the TECHNICIAN mode.
3) Press the keys in the order of “MENU”→”TECHNITIAN”→”CALIBRATION”→”PRESSURE” to display the PRESSURE CALIBRATION screen.
4) Press PG4a and PG5 below the camera icon to turn them to orange.
5) Press and hold the CLEAR button at the bottom of the screen to reset the COEFFICIENT value.
6) When the OFFSET button is pressed, the button turns yellow and TIME LEFT countdown starts. In the meantime, the machine records the data at the atmospheric pressure.
7) When TIME LEFT becomes 0 and data recording is complete, OFFSET values (b1 and b2) are automatically calculated and displayed based on the data recorded.

2-2 Confirmation after calibration

1) Confirm the PG4a and PG5 VALUE are within 0 ± 5 mmHg under the atmospheric pressure condition.
2) Connect the calibration equipment to the arterial / venous pressure port, and pressurize around 400 mmHg. Confirm that the PG4a and PG5 values are within the displayed value ± 5 mmHg of the standard pressure gauge.
3) If the results of step 1) or 2) or both are failed, follow calibrate the sensor(s) under the pressurized condition referred to 2-3.

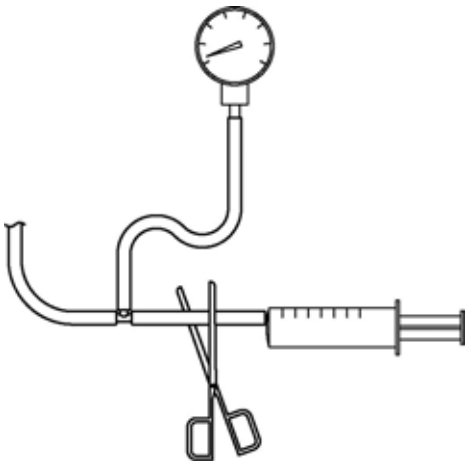
2-3 Calibration under the pressurized condition

1) Turn ON the power supply and enter the TECHNICIAN mode.
2) Press the keys in the order of “MENU”→”TECHNITIAN”→”CALIBRATION”→”PRESSURE” to display the PRESSURE CALIBRATION screen.
3) Press the sensor needs to be calibrated below the camera icon, and to turn it to orange.
4) Confirm that LOW POINT value is 0 mmHg and HI POINT is 500 mmHg. If these values are different, touch the number and input correct values by the ten-key pad.
5) Press and hold the CLEAR button at the bottom of the screen. To reset the COEFFICIENT value.
6) Press the number below the TIME LEFT button and input “60” by the ten-key pad.
7) When the LOW POINT button is pressed, the button turns yellow and the countdown of the TIME LEFT starts. In the meantime, the machine records the data at atmospheric pressure.
8) When TIME LEFT becomes 0 and data recording is complete. Again, input “60” into the time left and press ENTER.

NOTE

Although CALCULATE button appears and flashes, do not touch it.

9) Connect the calibration equipment to the blood pressure port needs to be calibrated.
10) By the syringe, to apply air pressure at 500mmHg to the pressure sensor. Read the pressure though standard pressure gauge and adjust it at 500mmHg. Clamp the tube between syringe and T-connector to hold the pressure (see figure on right).
11) When the HI POINT button is pressed, it turns yellow and TIME LEFT starts countdown. In the meantime, the machine records the data at 500mmHg.
12) When TIME LEFT becomes 0 and data reading is complete, the CALCULATION button appears. Press and hold this button. COEFFICIENT value is calculated and displayed based on the data.



Blockage of tube

13) Repeat 2-2 Confirmation after calibration. If the results are failed, repeat 2-3.
14) If the results are passsed, press the EXIT button to exit from the calibration screen.

15.3.3. Temperature sensor calibration (For software version Ver.04 or later)

This procedure applies to software version Ver.04 or later. Check the software version of your machine and follow the procedure if applicable.
(If you do not know to verify the software version, on the wake-up screen right after the machine turned on.)

1. Instrument and tools required
   Calibrated temperature meter (which can be connected to the dialyzer coupler.), 2 clamps (Used for T2/T4 calibration)

NOTE

If you do not have the connectable temperature meter to the coupler, calibration can be performed by directly connecting a temperature meter to the dialysate line tube. In this case, remove the dialyzer coupler from the coupler holder beforehand, and then put into the container with water. Calibration cannot be performed if the machine detects the presence of the coupler.

2. Procedure

2-1 Calibration of T1 and T3

1) Close the front door and back cover.
2) Connect the calibrated temperature meter to the dialyzer coupler.
3) Turn ON the power supply and enter the TECHNICIAN mode.
4) Press the keys in the order of “MENU”→”TECHNICIAN”→”CALIBRATION”→” TEMPERATURE” to display the TEMPERATURE CALIBRATION screen.
5) Press the T1 and T3 below the camera icon, and turn them to orange. Confirm that temperature sensor other than T1 and T3 are not selected (gray).
6) Press and hold the CLEAR button to reset the COEFFICIENT value.
7) Press the number portion at the right side of the CHECK button. Enter “25.0” by ten-key pad and press ENTER.
8) When the CHECK button is pressed, temperature adjustment starts and the button turns yellow.
9) Run the machine under this condition for approx. 5 minutes. Monitor the temperature displayed at VALUE (°C), and confirm that it reaches around 25.0°C and it is stable.

NOTE

Press the GRAPH button located at the bottom of the screen to display the temperature trend graph. If the temperature amplitude is within ±0.3°C for 10 seconds, it is regarded as stable.

NOTE

When water supply temperature is higher than 25.0 degrees Celsius, please wait to be stable **at the temperature**.

NOTE

If the displayed temperature value looks incorrect or wrongly, air bubbles are possibly accumulated in the temperature sensor portion. Remove the air bubbles and calibration again.

10) After confirming that the temperature is stable, read the value indicated by the Standard temperature meter.
11) Press the number portion at the right side of the LOW POINT button. By the ten-key pad, enter the value indicated by the Standard temperature meter, and press ENTER.
12) Press the LOW POINT button to measure LOW POINT Temperature. Pressing LOW POINT button starts the measurement, and it turns yellow. The button returns to gray when the measurement is finished.
13) Press CHECK button to finish LOW POINT measurement. The CHECK button turns gray.
14) Press the number portion at the right side of the CHECK button. Enter “37.0” by the ten-key pad and press ENTER.
15) When the CHECK button is pressed, temperature adjustment starts and the button turns yellow.
16) Run the machine under this condition for approx. 5 minutes. Monitor the temperature displayed at VALUE (°C), and confirm that it reaches stable around 37.0°C and it is stable.

NOTE

Press the GRAPH button located at the bottom of the screen to display the temperature trend graph. If the temperature change is within ±0.3°C for 10 seconds, it is regarded as stable.

17) After confirming that the temperature is stable, read the value indicated by the Standard temperature sensor.
18) Press the number portion at the right side of the HI POINT button. By the ten-key pad enter the value indicated by the Standard temperature meter and press ENTER.
19) Press the HI POINT button to measure LOW POINT Temperature. Pressing HI POINT button starts the measurement, and it turns yellow. The button returns to gray when the measurement is finished. CALCULATE button appears in the bottom of screen.
20) Press and hold the CALCULATE button to calculate COEFFICIENT of T1 and T3 (a1, a2, b1 and b2).
21) Confirm that the values indicated in T1, T3 and the Standard temperature sensor indicate almost same values.
22) Press CHECK button to stop temperature calibration.

23) Press theT1 and T3 below the camera icon, and turn them to gray to cancel the selection.

2-2 Calibration of T2 and T4

When the system is not in operation, check the temperature difference between T2 and T4 from the TEMPERATURE CALIBRATION screen. If the difference is ± 0.4°C or higher, calibrate T2 and T4.

1) Turn OFF the power supply.
2) Open the back cover and close a clamp at the lower side of the T2 and T4 tubes.
3) Remove the lower side of the CD2 tube and connect the Standard temperature meter inbetween.

⚠ CAUTION

If the tube is removed, air bubbles can enter the tube or temperature sensor. This can cause failure in dialysate temperature measurement. Take extra caution not to allow air to enter when removing the tube.

4) Remove the clamp and confirm that connection is proper. Turn ON the power supply and enter the TECHNICIAN mode.
5) Press the keys in the order of “MENU”→”TECHNICIAN”→”CALIBRATION”→”TEMPERATURE” to display the TEMPERATURE CALIBRATION screen.
6) Press the T2 and T4 below the camera icon, and turn them to orange. Confirm that temperature sensor other than T2 and T4 are not selected (gray).
7) Press and hold the CLEAR button to reset current value.
8) Press the number portion at the right side of the CHECK button. Enter “25.0” by ten-key pad and press ENTER.
9) When the CHECK button is pressed, temperature adjustment starts and the button turns yellow.
10) Run the machine under this condition for approx. 5 minutes. Monitor the temperature displayed at VALUE (°C), and confirm that it reaches around 25.0°C and it is stable.

NOTE

Press the GRAPH button located at the bottom of the screen to display the temperature trend graph. If the temperature change is within ±0.3°C for 10 seconds, it is regarded as stable.

NOTE

When water supply temperature is higher than 25.0 degrees Celsius, please wait to be stable **at the temperature**.

NOTE

If the displayed temperature value looks incorrect or wrongly, air bubbles are possibly accumulated in the temperature sensor portion. Remove the air bubbles and calibrate again.

11) After confirming that the temperature is stable, read the value indicated by the Standard temperature meter.
12) Press the number portion at the right side of the LOW POINT button. By the ten-key pad, enter the value indicated by the Standard temperature meter, and press ENTER.
13) Press the LOW POINT button to measure LOW POINT Temperature. Pressing LOW POINT button starts the measurement, and it turns yellow. The button returns to gray when the measurement is finished.
14) Press CHECK button to finish measurement of 25°C.
15) Press the number portion at the right side of the CHECK button. Enter “37.0” by the ten-key pad and press ENTER.
16) When the CHECK button is pressed, temperature adjustment starts and the button turns yellow.
17) Run the machine under this condition for approx. 5 minutes. Monitor the temperature displayed at VALUE and confirm that it reaches around 37.0°C and it is stable.

NOTE

Press the GRAPH button located at the bottom of the screen to display the temperature trend graph. If the temperature change is within ±0.3°C for 10 seconds, it is regarded as stable.

18) After confirming that the temperature is stable, read the value indicated by the Standard temperature sensor.
19) Press the number portion at the right side of the HI POINT button. By the ten-key pad, enter the value indicated by the Standard temperature meter and press ENTER.
24) Press the HI POINT button to measure HIGH POINT Temperature. Pressing HI POINT button starts the measurement, and it turns yellow. The button returns to gray when the measurement is finished. CALCULATE button appears in the bottom of screen.
20) Press and hold CALCULATE button to calculate COEFFICIENT of T2 and T4 (a1, a2, b1 and b2).
21) Confirm that the values indicated in T2, T4 and the Standard temperature sensor indicate the almost same values.
22) Press CHECK button to stop temperature adjustment.
23) Touch the display portion of T2 and T4 below the camera icon to cancel the selection.

15.3.4. Conductivity sensor calibration (For software version Ver.04 or later)

This procedure applies to software version Ver.04 or later. Check the software version of your machine and follow the procedure if applicable.
(If you do not know to verify the software version, on the wake-up screen right after the machine turned on.)

1. Instrument and tools required
   Standard conductivity sensor (which can be connected to the dialyzer coupler), Solution that is 60 mS/cm or higher (Dialysate A solution can be used)

NOTE

Even if you do not have the standard conductivity sensor that can be connected to the dialyzer coupler, calibration can be performed. See reference listed later in this chapter for details.

2. Procedure

2-1 Calibration

1) Close the front and back doors.
2) Connect the standard conductivity sensor to the dialyzer coupler.

3) Turn ON the power supply and enter the TECHNICIAN mode.
4) Press the keys in the order of “MENU”→”TECHNICIAN”→”CALIBRATION”→”CONDUCTIVITY” to display the CONDUCTIVITY CALIBRATION screen.
5) Touch and select the CD1, CD2, CD3 and CD4 display portions below the camera icon to turn on the orange.
6) Press and hold the CLEAR button located at the bottom of the screen to reset the COEFFICIENT value.
7) Remove the blue nozzle and insert it into the container with the solution that has 60 mS/cm or higher. (Recommendation: A solution)
8) Press the number portion at the right side of the CHECK button to display the ten-key pad. Enter “2.0” and press ENTER.
9) Press the CHECK button. When the CHECK button turns yellow, the P4 pump starts. The solution is aspirated from the blue nozzle and it sends the solution to the coupler side.
10) Run the machine under this condition for approx. 2 minutes. Monitor the conductivity displayed at VALUE and confirm that it becomes stable around 1.5-2.5 mS/cm.

NOTE

Press the GRAPH button located at the bottom of the screen to display the conductivity change graph. If the temperature amplitude is within ±0.3°C for 10 seconds, it is regarded as stable.

NOTE

If the conductivity value might be displayed incorrect or wrongly, air bubbles are possibly accumulated in the conductivity sensor portion. Remove the air bubbles and repeat the procedure.

11) After confirming that the conductivity is stable, read the value indicated by the standard conductivity sensor.
12) Press the number portion at the right side of the LOW POINT button to display the ten-key pad. Enter the value indicated by the standard conductivity sensor in 2) and press ENTER.
13) When the LOW POINT button is pressed, the button turns yellow and TIME LEFT countdown starts. In the meantime, the machine records conductivity data of each sensor. Record the data while conductivity sensor for calibration is recording the data.
14) After recording data is complete, the light of the LOW POINT button goes off.
15) Press CHECK button to stop the pumps.
16) Press the number portion at the right side of the CHECK button to display the ten keys. Enter “16.0” and press ENTER.
17) Press the CHECK button. When the CHECK turns yellow, the P4 pump starts. The solution is aspirated from the blue nozzle and it sends the solution to the coupler side.
18) Run the machine under this condition for approx. 5 minutes. Monitor the conductivity displayed at VALUE and confirm that it becomes stable around 15.0-17.0 mS/cm.

NOTE

Press the GRAPH button located at the bottom of the screen to display the conductivity change graph. If the temperature amplitude is within ±0.3°C for 10 seconds, it is regarded as stable.

NOTE

If the conductivity value might be displayed incorrect or wrongly, air bubbles are possibly accumulated in the conductivity sensor portion. Remove the air bubbles and repeat the procedure.

19) After confirming that the conductivity is stable, read the value indicated by the standard conductivity sensor.
20) Press the number portion at the right side of the HI POINT button to display the ten-key pad. Enter the value indicated by the standard conductivity sensor in 2) and press ENTER.
21) When the HI POINT button is pressed again, blinking light changes to the state of being lit, and TIME LEFT countdown starts. In the meantime, the machine reads conductivity data of each sensor. Record the data while conductivity sensor for calibration is reading the data.
22) After reading data is complete, the light of the HI POINT button goes off, and the CALCULATE button appears and blinks.
23) Press and hold CALCULATE button to calculate the value of Coefficient data. Correction coefficient will be calculated automatically and it will be displayed in the COEFFICIENT column.
24) Press CHECK button to stop the pumps.
25) Touch the display portion from CD1 to CD4 below the camera icon to cancel the selection.

NOTE

An air bubble may stick to the conductivity sensor or the sensor is stained when the indication column of Coefficient turned red. Please carry out calibration again after rinsing hydraulic line.

2-2 Confirmation after calibration

1) Touch the number portion at the right side of the CHECK button to display the ten-key pad and enter 14.0 mS/cm.
2) When the CHECK button is pressed, the solution is aspirated through the blue nozzle. The P4 pump works so that it will be 14.0mS/cm and the solution will be sent to the coupler side.
3) Run the machine under this condition for approx. 5 minutes. Monitor the conductivity displayed at VALUE and confirm that the value is stable.

NOTE

Press the GRAPH button located at the bottom of the screen to display the temperature change graph. If the conductivity stays at 14.0±0.3 mS/cm for 10 seconds, it is regarded as stable.

4) Confirm that it is within the target range. Press the CHECK button again to stop its running. If it is not within the range, repeat calibration.
5) Press the EXIT button and perform WATER RINSE for 10 minutes or longer. Next, return to the CONDUCTIVITY CALIBRATION screen and confirm that the value of each sensor is within the range of 0.1-0.3 mS/cm. If it is not within the range, repeat calibration.

REFERENCE

When the standard conductivity sensor that can be directly connected to the coupler holder is not available, measure the basic conductivity by the following procedure.

When reading the value indicated by the standard conductivity sensor, do so by the following procedure:

1) Prepare a container with 10 L or more water. Soak the red and blue dialyzer coupler holders and start calibration.
2) Pull up the blue dialyzer coupler from the container.
3) Collect the solution that is discharged from the blue dialyzer coupler in a separate container. (Leave the red dialyzer coupler in water.)
4) Measure the conductivity of the collected solution.

15.4. Blood sensor calibration (BD)

15.4.1. Blood sensor calibration (BD) (For amp type: FX-D1)

Note) This procedure is applicable to the sensor amps (SUNX Limited FX-D1) equipped with the models with serial No. 03A0001E to No. 04A0207E. Check the serial No. of equipment, and perform the applicable procedure.

1. Instrument and tools required

   Bloodline tube filled with saline (or water), Bloodline tube filled with simulated blood

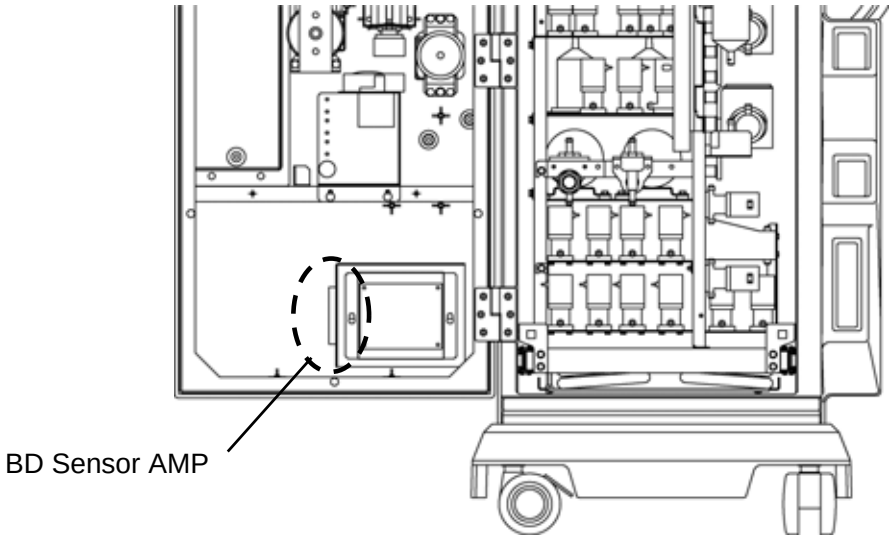
⚠ CAUTION

Do not set the mode change switch of the sensor amp to MODE in this adjustment.

2. Procedure

1) Turn ON the power supply.

2) Open the front door. Confirm that a number is displayed on the blood sensor amp located at the lower portion of the back of the door.



⚠ CAUTION

Sensor fiber is extremely delicate. Take extra caution not to bend or damage the coating.

If the output of sensor amp is extremely low, check the following:

- Connection of the sensor fiber amp (check the lock lever)
- Check if the sensor fiber is bending or there is damage on the coating
- Check if the receiver or reflector of the sensor is soiled

If the status is not improved after checking the above points, the sensor amp, blood sensor fiber, or reflector needs to be replaced.

3) Press the keys in the order of “MENU”→”TECHNICIAN”→”CALIBRATION”→”BD / AIR / BLD SENSOR” to display the BD CALIBRATION screen.

4) Empty inside of the clamp cover and confirm the clamp cover is closed.

5) Touch the number portion at the right side of the STANDARD button to display the ten-key pad .Enter the value indicated in the blood sensor amp.

6) Machine calculates the value of threshold level and indicates in threshold column.

7) Enter the threshold level in the amp. (See Figure 2)

I. Open the cover of the amp.

II. Bring the mode change switch to the RUN side.

III. Turn the JOG switch to the ＋ or － side and set it as the detection output 1.

NOTE

When the JOG switch is pressed accidentally, the display changes to %. Press the JOG switch again to return to the original display.

IV. Bring the mode change switch to the SET side. The current threshold level is displayed.

V. Enter the value of threshold level displayed in 6) to the amp. The threshold level gradually increases when the JOG switch is turned to the ＋ side. When it is fully turned to the ＋ side, the threshold level will increase by the fast forwarding mode. Turn the JOG switch to the － side to gradually decrease the threshold level. When it is fully turned to the － side, the threshold level will decrease by fast the forwarding mode.

VI. Bring the mode change switch to the RUN side.

VII. Also enter the threshold level to the detection output 2, same as above procedure 7) **I** to **VII**.

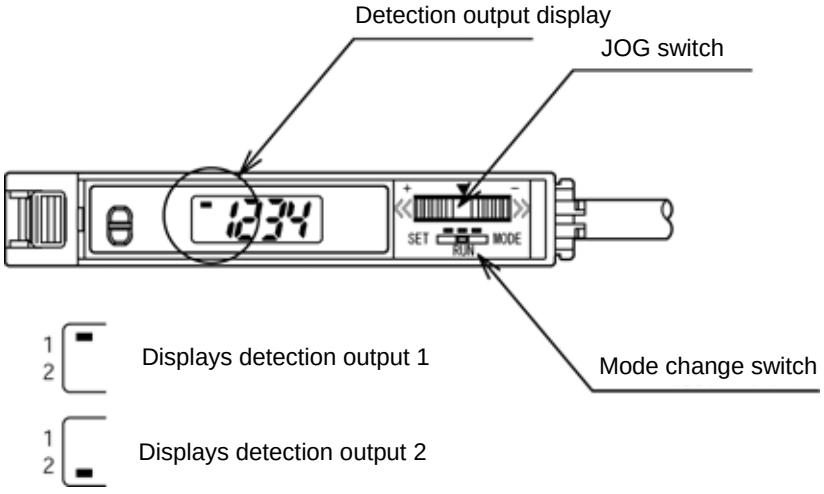


Figure 2 Rough sketch of the blood sensor amp

8) After entering the threshold level detection output 2, bring the mode change switch to the RUN side and install the cover.

1) Press the keys in the order of “MENU”→”NURSE”→”MONITOR”→”FLOW MONITOR”→”FLOW2” to display the FLOW2 MONITOR screen. Confirm that the graphic display of the bloodline is the same as shown in Table 2 under the conditions of following “a” and “b”

a When bloodline tube filled with saline (or water) is set to the blood sensor.

b When bloodline tube for simulated blood is set to the blood sensor.

Table 2

Type of tube	Color of bloodline
Tube is not inserted (Clamp cover is closed)	Gray
Saline tube (Above “a”) is inserted	Blue
Simulated blood tube (Above “b”) is inserted	Red

15.4.2. Blood sensor calibration (BD) (For amp type: FX-301)

Note) This procedure is applicable to the sensor amps (SUNX Limited FX-301) equipped with the models with serial No. 04A0208E or later. Check the serial No., and perform the applicable procedure.

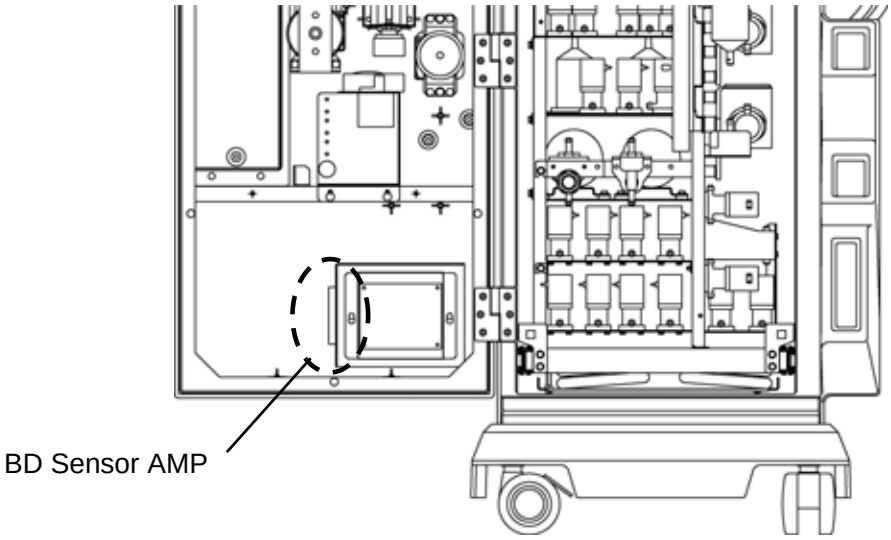
1. Instrument and tools required

- Bloodline tube filled with saline (or water).
- Bloodline tube filled with simulated blood.

2. Procedure

2) Turn ON the power supply.

3) Open the front door. Confirm that a number is displayed on the blood sensor amp located at the lower position of the back of the door.



⚠ CAUTION

Sensor fiber is extremely delicate. Take extra caution not to bend or damage the coating.
If the sensor amp output is extremely low, check the following:

- Connection of the sensor fiber amp (check the lock lever)
- Check if the sensor fiber is bending or there is damage on the coating.
- Check if the receiver or reflector of the sensor is soiled.

If the status is not improved after checking the above, the sensor amp, blood sensor fiber or reflector need to be replaced.

4) Press the keys in the order of “MENU”→”TECHNICIAN”→”CALIBRATION”→”BD / AIR / BLD SENSOR” to display the BD CALIBRATION screen.

5) Enter the threshold level in the amp.
(Refer to Figure 3.)

i Press the Mode change switch several times to bring the mode display LED to Pro. (Pro is displayed).

ii The PRO mode can be entered by pressing JOG switch, and Pro 1 to Pro 5 can be selected by turning the JOG switch to be + or – side several times. In this step, press the JOG switch with Pro1 displayed to select Pro1.

iii Turn the JOG switch to the + or – side several times to display SPEd, and press the JOG switch select SPEd.

iv When S-d is not displayed, display S-d by turning the JOG switch to the + or – side several times, and press the JOG switch to select S-d mode.

v Return to the initial status by pressing the Mode changing switch several times. Check that RUN is displayed for the mode display LED.

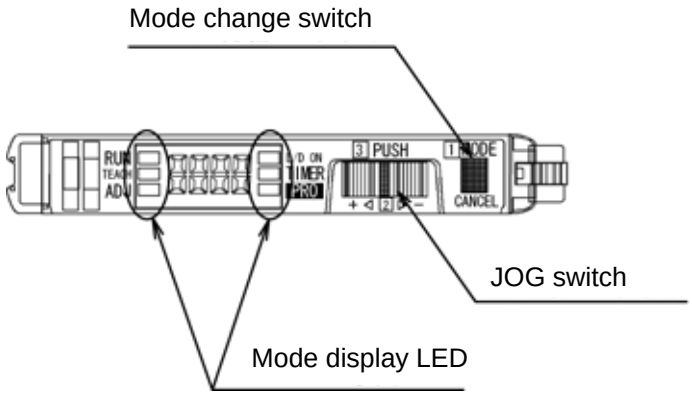


Figure 3 Rough sketch of the blood sensor amp

6) Empty inside of the clamp cover and confirm the clamp cover is closed.

7) Touch the number portion at the right side of the STANDARD button to display the ten-key pad and enter the value indicated in the blood sensor amp.

8) Machine calculates the value of threshold level and indicates in threshold column.

9) Enter the threshold level in the amp.

i Press the Mode change switch several times to bring the mode display LED to ADJ. (The current threshold level is displayed.)

ii Turn the JOG switch to the + or – side to adjust display value that is the threshold level to calculated value in step 5)

NOTE

When turning the JOG switch to the + side, the threshold level is raised slowly at first and then gradually faster. When turning it to the – side, the threshold level is lowered slowly at first and then gradually faster.

iii When the threshold level to be set is displayed, press the JOG switch to enter it.

iv Return to the initial status by pressing the Mode change switch several times. Check that RUN is displayed for the mode display LED.

10) After entering the threshold level, attach the cover.

11) Confirm that the machine properly recognizes the Blood tube condition. Press the keys in the order of “MENU > NURSE > MONITOR > FLOW MONITOR > FLOW 2 to display the FLOW2 MONITOR screen. Confirm that the graphic display of the bloodline is the same as shown in Table 3 under the conditions of following “a” and “b”

a When bloodline tube filled with saline (or water) is set to the blood sensor.

b When bloodline tube for simulated blood is set to the blood sensor

Table 3

Type of tube	Color of bloodline
Tube is not inserted (Clamp cover is closed)	Gray
Saline tube (Above “a”) is inserted	Blue
Simulated blood tube (Above “b”) is inserted	Red

Reference:

If you had wrong calibrate, and you cannot calibrate it properly, you should reset it once and calibrate again.

So this normally, you do not need RESET color sensor.

RESET of blood color sensor (BD) (For amp type: FX-301)

Note) This procedure is applicable to the sensor amps (SUNX Limited FX-301) equipped with the models with serial No. 04A0208E or later. Check the serial No. and perform the applicable procedure.

Procedure

1) Turn ON the power supply.
2) Open the front door. Confirm that a number is displayed on the blood sensor amp located at the lower position of the back of the door.

⚠CAUTION

Sensor fiber is extremely delicate. Take extra caution not to bend or damage the coating.
If the sensor amp output is extremely low, check the following:

- Connection of the sensor fiber amp (check the lock lever)
- Check if the sensor fiber is bending or there is damage on the coating.
- Check if the receiver or reflector of the sensor is soiled.

If the status is not improved after checking the above, the sensor amp, blood sensor fiber or reflector need to be replaced.

3) Change the sensor amp mode from the Std mode to the S-d mode (dim mode). (Refer to Chapter 15.4.2: Figure 3.)

i Press the Mode change switch several times to bring the mode display LED to Pro. (Pro is displayed).

ii The PRO mode can be entered by pressing JOG switch, and Pro 1 to Pro 5 can be selected by turning the JOG switch to be + or – side several times. In this step, press the JOG switch with PRO 1 displayed to select Pro 5.

iii Turn the JOG switch to the + or – side several times to display , and press the JOG switch select it.

15.5. Blood Pump

15.5.1. Adjustment of BP (Blood Pump) closed condition

[When using a large diameter tube (Inner dia. ϕ8 mm) bloodline]

1. Instruments and tools required
   Arterial side bloodline, Box wrench (7 mm), calipers

2. Procedure

(1) Pull the handle to toward the front, and remove rotor. (Refer to Chapter11.3.25 Blood Pump.)

(2) Adjust the gap between the rotor and the rotor bracket (See table below.). The gap increases when the gap adjusting nut is turned counterclockwise, and decreases when turned clockwise.

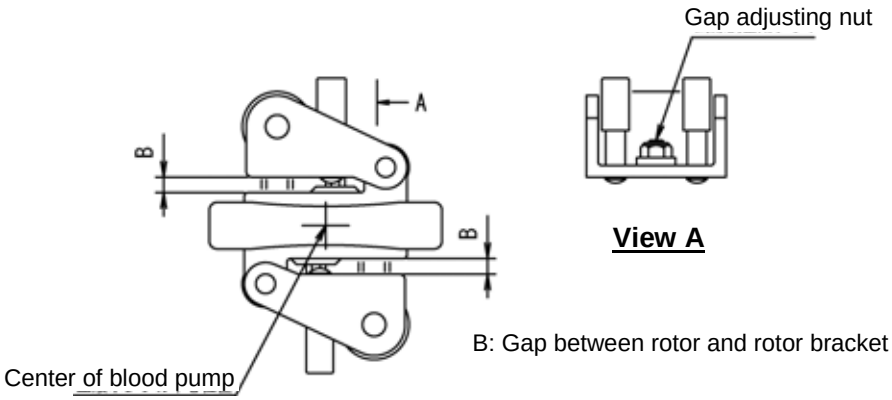


Table: Dimension of Gap B

Bloodline size	Large diameter Inner dia. ϕ8	Small diameter Inner dia. ϕ6
Aluminum Casing (silver)	3.5mm	4.2mm
Plastic Casing (white)	3.9mm	4.6mm

(3) Set the bloodline to the blood pump and perform priming of the bloodline.

(4) Block the rolling tube of the bloodline with one roller.

(5) Set up the bloodline so that the vertical distance from the center of the blood pump to the tip of the bloodline on the discharge side becomes approximately 1.5 meter.

(6) Confirm that there is no liquid leak from the suction side of the bloodline.

(7) Turn the rotor step by step by 45° at one time from the position in Step (6) and confirm that there is no liquid leak at each turning position. Continue this check until the rotor returns to its original orientation.

(8) If any liquid leak is observed, increase the gap between the rotor and the rotor bracket (B). and then perform the leak check in the procedures in Steps (2) to (6) again.

(9) Make the gap adjustment until liquid leak is completely eliminated by repeating the above procedures.

15.5.2. Calibration of BP (Blood Pump) flow rate (For software version Ver.04 or later)

This procedure applies to software version Ver.04 or later. Check the software version of your machine and use the appropriate procedure. (If you do not know the version, it is displayed by screen right after power supply of the machine is turned on.)

1. Instrument and tools required

   Electronic balance (or measuring cylinder that can hold approx. 1000 mL), Measuring container 1 L or more), Arterial side bloodline, Bucket

2. Procedure

1) Set the Arterial side bloodline on the machine and soak it into the bucket filled with water to prime the bloodline.
2) Turn ON the power supply. Water is filled up in the bloodline by running the blood pump.
3) Enter the TECHNICIAN mode, and press the keys in the order of “MENU”→”TECHNICIAN” →”CALIBRATION”→”BP PUMP” to display the BP CALIBRATION screen.
4) Prepare an electronic balance, and place the measuring container on it.
5) Measure the measurement container with electric balance, and input the gram value of container to START VOLUME column.
6) Place the outlet side of the bloodline into the measuring container.
7) Press the 8.25mm or 6.35mm button to select the tube to be used.
8) Press and hold the OFFSET button. The blood pump starts rotating. It stops automatically after a certain period of time passes.
9) Take out the bloodline from the measuring container and read the display on the electronic balance. Input the gram value into the END VOLUME column.
10) Press and hold the OFFSET button. The offset value is calculated automatically and the color of the button returns to the original color.
11) Set the bloodline again in accordance with the procedures (5) and (6).
12) Press and hold the GAIN button. The blood pump starts rotating and stops automatically after a certain period of time passes.
13) Take out the bloodline from the measuring container and read the display on the electronic balance And input the gram value of container to END VOLUME column.
14) Press and hold the GAIN button. The gain value is calculated automatically and the color of the button returns to the original color.
15) When calibration is complete, use the same bloodline to measure the flow volumes for when the BP runs at 100 mL/min, 300 mL/min, and 600 mL/min settings. Confirm that the measurement is within the range of the preset flow ±10%.The confirmation of flow quantity, check the following reference.

Reference: Verification test of BP rate

1) Set the Arterial side bloodline on the machine and soak it into the bucket filled with water to prime the bloodline.
2) Prepare an electronic balance, and place the measuring container on it.
3) Measure the Measurement container with electric balance, and input the value of container to START VOLUME column.
4) Place the outlet side of the bloodline into the measuring container.
5) Press the 8.25mm or 6.35mm button to select the tube to be used.
6) Press and hold the CHECK 100 button. The blood pump starts rotating with 100mL/min. It stops automatically after 60 seconds.
7) Take out the bloodline from the measuring container and read the display on the electronic balance. And input the value of container to END VOLUME column.
8) Press and hold the CHECK 100 button. It judges flow quantity accuracy from measured value.

NOTE

When the CHECK100 column is red, it means that is out of the standard range. In that case carry out the pump calibration again.

9) Confirm flow quantity accuracy of 300mL/min, 600 mL/min as well.

NOTE

If it is not within the above range, adjust in accordance with “Confirmation of BP (Blood Pump) closed condition” and calibrate the BP flow again.

15.6. Syringe Pump

15.6.1. Working point adjustment of syringe pump overload limit switch

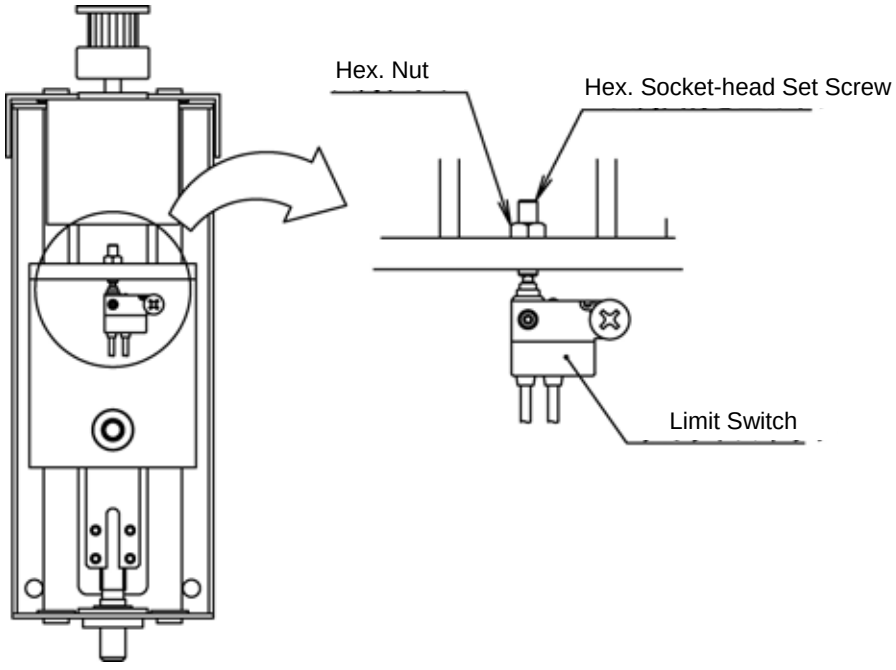
1. Instruments and tools required

   Hexagon wrench (2 mm), Spanner wrench (7 mm)

2. Procedure

   1) Push down the pusher to the bottom.
   2) Open the front door of the machine and turn ON the power supply.
   3) Loosen “the hex. Nut”
   4) Loosen “the hex. socket-head set screw” by turning it counterclockwise and stop loosening it at the position where the overload limit switch turns OFF. (See the display MENU – NURSE – MONITOR – LIST MONITOR – LIMIT). When the overload limit switch OFF, LIMIT color changes to yellow.
   5) Syringe pump overload error (0230 HEPARIN LIMIT SW ON) occurred.
   6) Turn “the hex. socket-head set screw” clockwise by approximately 270° from this position, and confirm the Syringe pump overload error has stopped.
   7) Fix “the hex. socket-head set screw” by tightening “the hex. nut”.

   (As “the hex. socket-head set screw” might turn around with “the hex. nut”, so hold “the hex. socket-head set screw” by Hexagon wrench while tightening “the hex. nut”.)



15.6.2. Overload adjustment of syringe pump (when using NIPRO 20 mL syringe)

<Standard Procedures>

1. Instruments and tools required
   Spring balance

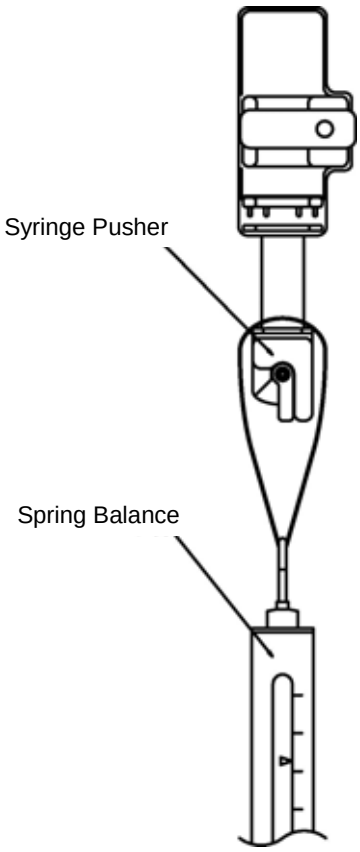


Fig. 1

2. Procedure
   1) Turn ON the power supply.
   2) Set the spring balance to the syringe pusher of the syringe pump and fix the spring balance not to move.
   3) Press the keys in the order of "MENU" → "NURSE" →"TREATMENT"→"HEPARIN".
   4) Press the RAPID button to run the syringe pump in the fast-forwarding mode.
   5) Stop the fast-forwarding movement as soon as the overload limit switch turns OFF and then read the value of the spring balance (See the display MENU – NURSE – MONITOR – LIST MONITOR – LIMIT). When the overload limit switch OFF, LIMIT color changes to yellow.
   6) Confirm the value of the spring balance (See table 1 next page).
   7) If the value is not within the range, adjust the overload setting by turning the adjusting nut (See Fig.2 below). As to the adjusting nut, force will be weaker when the nut is turned clockwise when seen from the top (arrow direction in the figure) of the syringe pump, and stronger when turned counterclockwise.

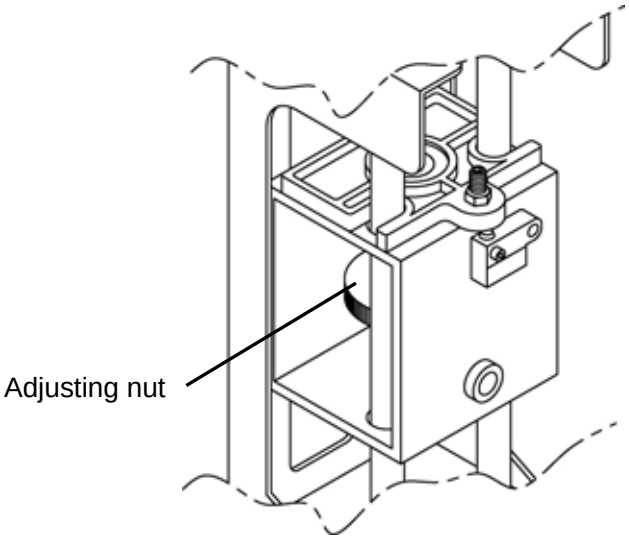


Fig.2

8) Check the adjustment again according to the steps (1) through (6) to confirm that the adjusted value falls within the acceptable range.

Table 1 Adjustment value

Serial No. of Machine	Adjustment value
Before 05A0309	3.5 – 4.0kgf
05A0310 or later	5.0 – 7.0kgf

<Simplified Procedures>

1. Instruments and tools required

   NIPRO 20 mL syringe (new one), Pressure gauge, etc.

2. Procedure

1) Turn ON the power supply.
2) Set a new NIPRO20mL syringe filled with water or saline solution to the syringe pump and connect a pressure gauge to the syringe as shown in Fig. 3.
3) Press the keys in the order of “MENU”→”NURSE”→”TREATMENT” →”HEPARIN.”
4) Press the RAPID button, and move the syringe pump in the fast-forwarding mode.
5) Stop the fast-forwarding movement as soon as the overload limit switch turns OFF and then read the value of the spring balance. (See the display MENU – NURSE – MONITOR – LIST MONITOR – LIMIT).
6) Confirm the pressure value is in the range of 0.10-0.12 MPa (750 – 900 mmHg).

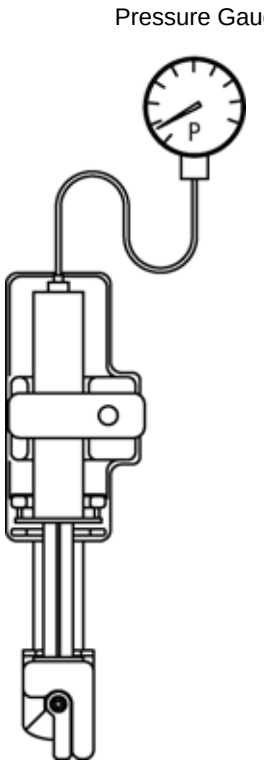


Fig. 3

NOTE

Be sure to use a new syringe since no accurate numerical value is obtained if a used syringe is used.

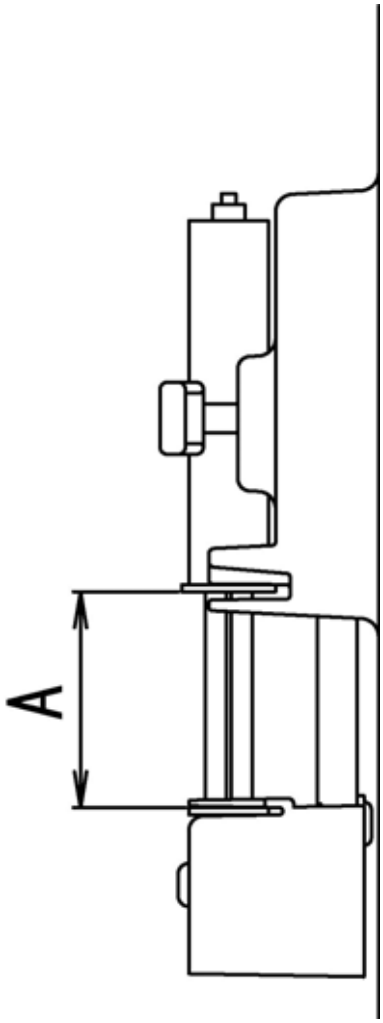
7) Adjust the adjusting nut as in the standard procedures if the measured pressure value is not within the acceptable range in the above step.
8) Confirm the adjusted value again according to the procedures in Steps (1) - (6) after adjustment.

15.6.3. Verification test of syringe pump stroke

1. Instruments and tools required
   Stopwatch, Calipers, NIPRO 20 mL syringe

2. Procedure

1) Turn ON the power supply and enter the TECHNICIAN mode.
2) Press the keys in the order of “MENU” → ”NURSE” →”TREATMENT”→”HEPARIN.”
3) Press the INITIAL button to open the Heparin Initial Data screen and confirm that SYRINGE SIZE is 20mL and RATIO is 100%. If RATIO is not 100%, record the present value and change it to 100%.
4) Return to the SETTING screen by pressing SETTING.
5) Push down the pusher to the bottom. Install an empty NIPRO 20mL syringe to the syringe pump and perform BOLUS once, afterwards measure the distance A shown in the right figure.



NOTE

Be sure to perform BOLUS once. If measured without performing BOLUS, the movement distance calculated later cannot be correctly measured.

6) Adjust FLOW RATE to 5mL/min and press the START button to start the pump.
7) Measure the distance A after the operation for one hour, and then confirm the difference in distance (movement distance) between at the beginning and at the end is within 15.5 ± 0.5 mm.
8) Return the setting value for RATIO of 20 mL to the original setting in the Heparin Initial Data screen.

15.6.4. Setting of syringe ratio (For software version Ver.04 or later)

This procedure applies to software version Ver.04 or later. Check the software version of your machine and follow the procedure if applicable.

(If you do not know to verify the software version, on the wake-up screen right after the machine turned on.)

NOTE

If a syringe is not manufactured by NIPRO, the syringe ratio needs to be set for the machine.

1. Instrument and tools required

   Electronic balance, 20 mL syringe, Tube for syringe connection, measuring container (Capacity: 50 mL or more)

2. Procedure

1) Turn ON the power supply and enter the TECHNICIAN mode.
2) Press the keys in the order of “MENU”→”TECHNICIAN”→”CALIBRATION”→”SYRINGE PUMP” to display the SYRINGE PUMP CALIBRATION screen.
3) Fill the syringe with water. Connect the tube so that water that comes out of the syringe and goes into a measuring container.
4) Push the syringe lightly and fill the tube with water and set it to the syringe pump.
5) Press the RAPID button to discharge approx. 5 mL. Remove air inside the tube completely.
6) Confirm the type of 20 mL syringe is selected. If other type of syringe is selected, press the 20 mL button to select 20mL type.
7) Press and hold the RATE button. The color of the button turns orange, and the syringe pump starts with set flow quantity. Keep it running until no air bubble found in a syringe and then, press and hold the RATE button to stop a syringe pump.
8) Place a container on the electronic balance. Measure a container weight, and input the gram value of container to START VOLUME column. Place the tube that is connected to the syringe into the measuring container.
9) Press and hold the RATE button again. When the RATE button is pressed, RATE button turns yellow and calibration starts.
10) When the setting time passes and the machine completes measurement, the syringe pump stops and the RATE button blinks. The calibration time is adjustable by changing TIME LEFT. Flow rate as well.
11) Pull out the tube from the measuring container, and read the number on the electronic balance.
12) Login the Technician mode again, and input the gram value to the END VOLUME column.
13) Press and hold RATE button, calibration stops and the CALCULATE button appears.
14) Press and hold the CALCULATE button, the value is calculated automatically.

Reference：Setting condition at the time of 15.6.4

FLOW RATE	5.0 mL/h
TIME LEFT	00:30 (30 min)
SYRINGE SIZE	20mL
RATE	100%

15) Repeat the steps 3)-15) to calibrate for 10 mL- and 30 mL- syringes.

⚠ CAUTION

The ratio that has a setting for each syringe shows the stroke ratio to standard syringes 10 mL/20 mL/30 mL. Be sure to calibrate the syringes of all sizes you will use.

15.7. Calibration of dialysate

1. Instruments and required
   Dialysate solution
2. Procedure

1) Turn ON the power supply of the machine and enter the TECHNICIAN mode.
2) Press the keys in the order of “MENU”→”TECHNICIAN”→”CALIBRATION”→”DIALYSATE SOLUTION” to open the Dialysate Solution Calibration screen.
3) Select one tab number (No,1 – No,4) to register dialysate concentrate.
4) Select the dialysis mode to use at CONCENTRATE TYPE, BICARBO or ACETATE.

A) Select BICARBO in step (4)

5) Touch the column of “SOLUTION A” or “SOLUTION B ” to input the names of the dialysate to use to SOLUTION A and SOLUTION B.
6) Input the dilution ratio of A concentrate and B concentrate to DILUTION.
7) Input the estimated conductivity value “TOTAL ”and “B+W” to A solution side and B solution side respectively. (The estimated conductivity is a theoretical conductivity.)
8) Set the dialysate solution (A solution and B solution) and hold the CALIBRATION button pressed for a while.

NOTE

Depends on the ESTIMATED COND. value, an alarm（0050 SOLUTION B CALIBRATION FAILER / 0051 SOLUTION A CALIBRATION FAILER）might occur. In this case, press the MUTE/RESET button and go ahead.

9) Press the FLOW MONITOR button on the lower left side of the screen to confirm that the hydraulic line is in work.
10) The color lamp blinks during the calibration and it turns off as soon as the calibration is complete. Return the aspiration nozzle for dialysate and execute rinse process.
11) Enter preparation-mode and confirm that any alarms do not occur.

B) Select ACETATE in step (4)

5) Input the names of the dialysate to use to SOLUTION A.
6) Input the dilution ratio of A concentrate to DILUTION.
7) Input the estimated total conductivity value. (The estimated conductivity is a theoretical conductivity.)
8) Set the dialysate concentrate (A concentrate) and hold the CALIBRATION button pressed for a while.

NOTE

Depends on the ESTIMATED COND. value, an alarm（0050 SOLUTION B CALIBRATION FAILER / 0051 SOLUTION A CALIBRATION FAILER）might occur. In this case, press the MUTE/RESET button and go ahead.

9) The color lamp blinks during the calibration and it turns off as soon as the calibration is complete. Return the aspiration nozzle for dialysate and execute rinse process.
10) Enter preparation-mode and confirm that any alarms do not occur.

16 Others

16.1. Upgrading and Confirmation of Software Version

This machine is furnished with the control P.C. board, the monitoring P.C. board, and the LCD display P.C. board and respective software is installed in each P.C. board. The machine is so designed to operate safely with these programs that runs cooperating to each other. Also, this machine is furnished with a CompactFlash memory slot so that the latest software can be loaded from the CompactFlash memory to easily upgrade the software.
This section explains the method to install software though the CompactFlash memory.

NOTE: CompactFlash is a trademark of SanDisk Corporation.

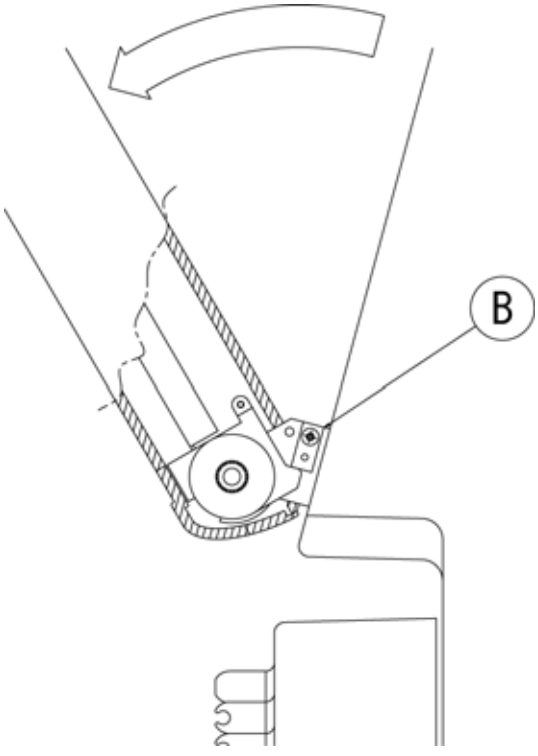
⚠CAUTION

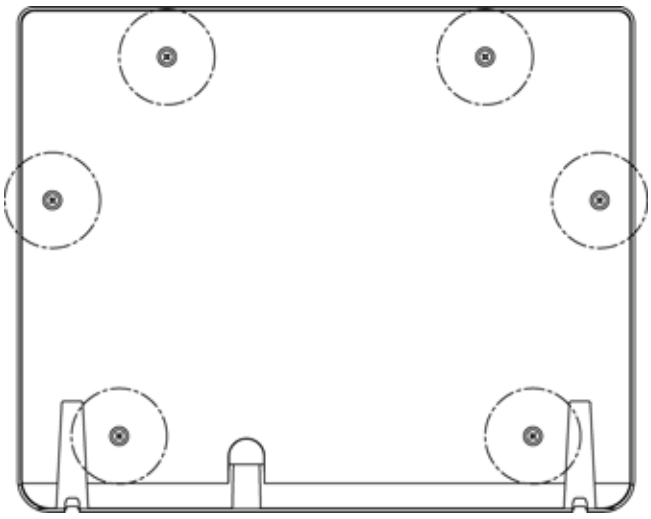
Take special caution on the static electricity when handling electric parts including a P.C. board. If this is failed, a P.C. board may be defected. In addition, do not touch a P.C. board with bare hand. The adhered sebum, etc. may cause rust.

16.1.1. Installation of software

1. Turn OFF the power supply and shut down the power breaker.

2. Lean the operation panel forward and remove the stopper metals (Part B in the right figure) mounted at the hinges on both the right and left sides with the Phillips screwdriver.

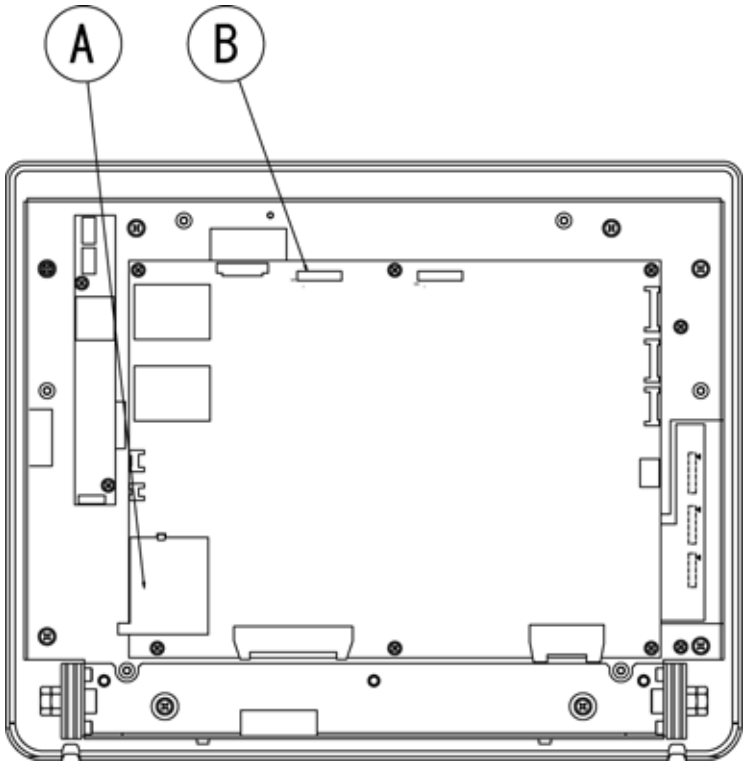




3. Remove the rear cover of operation panel by removing six screws with the Phillips screwdriver.

4. Section A is the CompactFlash memory slot.
Securely insert a CompactFlash memory card with the new software.

5. Set ON No.1 switch of the dip switch (SW1) at Section B.



6. Turn ON the power breaker, and turn ON the Power ON/OFF switch. Then, the Program Loading screen is displayed.

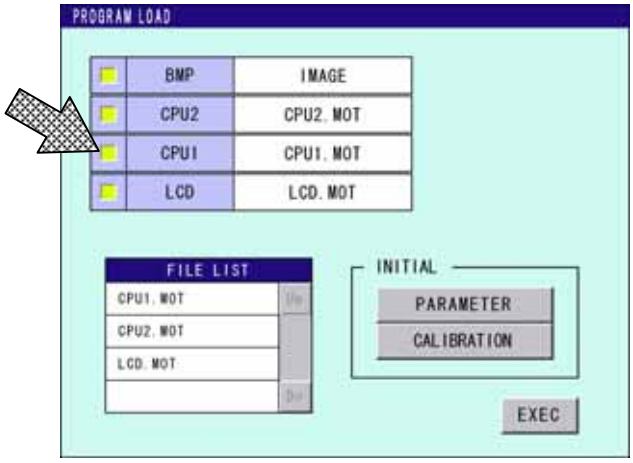
16.1.2. Loading program and language file (for software version V01)

This adjustment method applies to software version V01. Check the software version of your machine in advance.

⚠DANGER

Never turn the power off during loading program. This makes serious damage to the machine.

1. Touch the portion pointed by the arrow to select an intended item to update.



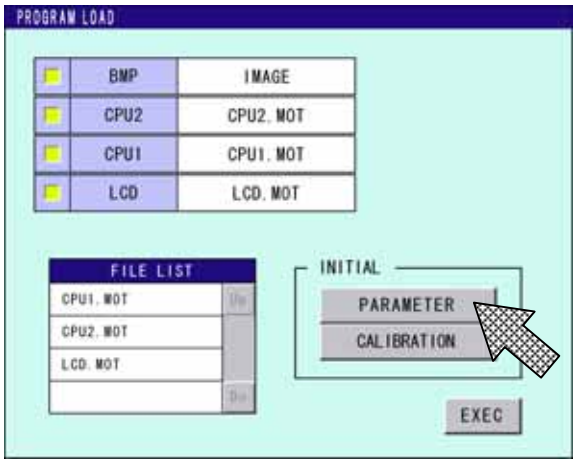
Display	P.C. board with the software to be renewed
CPU1	Control P.C. board
CPU2	Monitor P.C. board
LCD	LCD display P.C. board
BMP	Language text (Explained later.)

The standard language used in this machine is English, however the machine can display other language using the BMP files with corresponded language and the MULTILINGUAL function. This section explains the method to install other language.

⚠CAUTION

Be sure to load BMP data though the machine does not use MULTILINGUAL function.

2. It is also possible to initialize the input parameter and calibration test data respectively at the same time. In order to initialize each data, hold the botton pointed by the arrow pressed for a while. Then, the intended button is selected and the button turns ON in yellow.



⚠CAUTION

If you select Parameter or Calibration, the saved data of Calibration or parameter will be erased. We recommended to note all former data before initialize.

3. After confirming the selected item, press EXIT button. Then, the installation of the program will begin. The color lamps blink in the order of “red → yellow → green → blue” and blinking stops when the installation is complete.
4. After the installation of a program is complete, press the Power ON/OFF switch to turn OFF the power supply, pull out the CompactFlash memory, and then set OFF the dip switch set ON in the former step 5.
5. Attach the rear cover in the order reverse to its removal procedure and install the stopper metals at the root of the hinges.
6. When a file in other language is loaded, turn ON MULTILINGUAL function by following the steps below.
7. Turn ON the power supply by pressing the Power ON/OFF switch again and then log in in the TECHNICHIAN mode.
8. Press MENU and select TECHNICIAN tab to display the Technician Maintenance screen.
9. Press OPTION-SOFTWARE to display the Software Selection screen shown in the right figure.
10. Touch UNUSE at MULTILINGUAL pointed by the arrow in the right figure to switch it to USE and then press EXIT to restore the original screen.

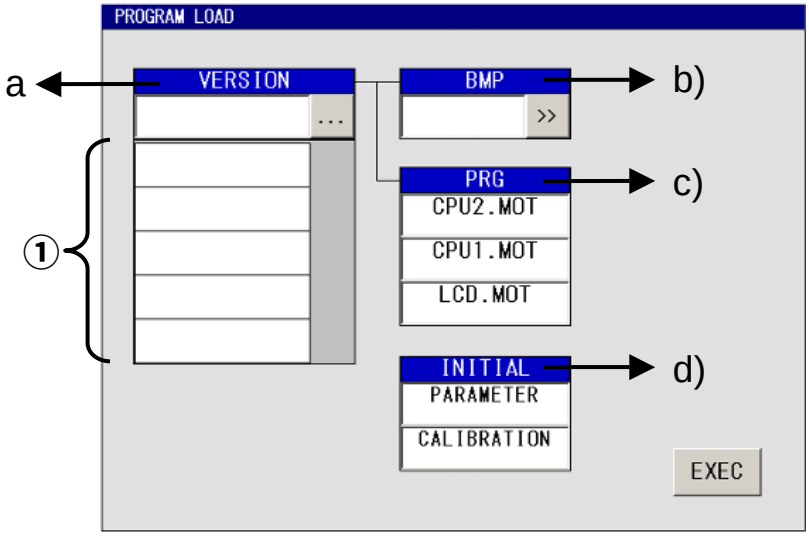
16.1.3. Loading program and language file (for software version V02 or later)

This adjustment method applies to software versions after V02. Check the software version of your machine in advance.

⚠DANGER

Never turn the power off during loading program. This makes serious damage to the machine.

Loading screen is as follows,



1. Version holder
   - Open ① window by "…" switch to see the program in CompactFlash.
   - Touch the title in ① window and select the version.
   - This window is blank if one program is in CompactFlash.
2. Language holder.
   - Switch language holder after pressing ">>" switch if some language holder are memorized in CompactFlash.
   - ">>" switch is disabled if one language holder is in CompactFlash.
3. PRG holder.
   - This window is blank if there is no MOT file.
4. Initialize parameter and calibration data same as previous version.

⚠CAUTION

If you select Parameter or Calibration, the saved Calibration or parameter will be initialized. We recommended to note all former data in the machine before initialize.

⚠CAUTION

Be sure to load BMP data though the machine does not use MULTILINGUAL function.

5. Touch and select loading file and then press "EXEC" switch.
6. Wait until "OK" is displayed on the right of all selected programs.

Reference: Procedure to arrange files and folders in Compact Flush for loading program (Later than Ver. 2.00 software installed DIAMAX only)

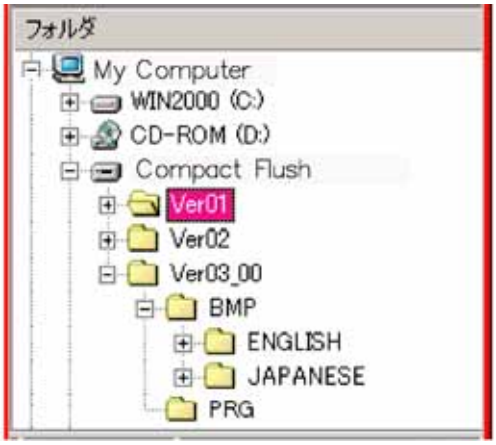
Preparing of CompactFlash:

We recommended using the CompactFlash manufactured by SanDisk Corporation.
The machine is designed that almost of CompactFlash cards manufactured by other makers can use, but some cards cannot use for DIAMAX.

NOTE

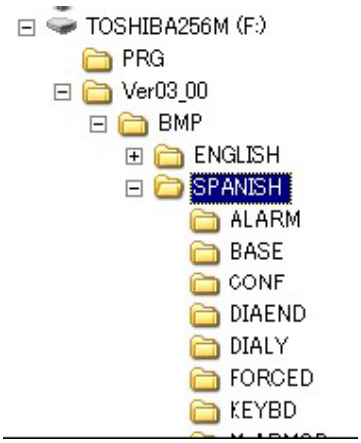
Some manufacture of compact flush could not use for DIAMAX. For more information, please contact the nearest branch or agency.

Please arrange folder of compact flush as following figure.



Please make folder that is version folder.

1. The folder name should **start from "VER"**
2. The folder name has to be within "5 characters" without "VER".
3. Do not use special character such as " ¥", "/ ","**:**", "*", "?"," < ", ">", "| " etc for the name, otherwise machine did not display at the screen of PROGRAM ROAD.
4. Please do not make more than 5 Version folders in the Compact Flash. If you arrange more than 6 version folders, one of them did not display.
5. Please put MOT files in the PRG folder.
6. File names of MOT are **fix name** that "**CPU1.MOT**","**CPU2.MOT**" and "**LCD.MOT**". Do not change their file names.
7. Please make or put Language folder in the BMP folder.
8. You can make name within "8 characters" like as JAPANESE, SPANISH, etc.
9. Please put "ALARM", etc folders into this Language folder (See following figure).



16.1.4. Confirm software version

Check the software version to confirm whether new software is installed.

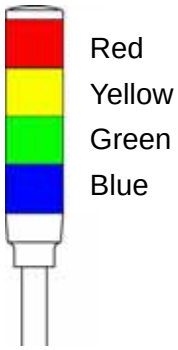
1. Press the Power ON/OFF switch to turn on the power.
2. The start-up screen is displayed, and Ver. is displayed under the logo “DIAMAX.” Check if the number has been updated.

Confirmation can be done while the machine is in operation.

1. Log in with the MAKER mode.
2. Press the MAKER tab to display the maker maintenance screen.
   For software version V01, press the SOFWARE VERSION button.
   For software version V02, press the INFORMATION button to display the SOFTWARE VERSION button.
3. Check if the software No and Ver of CPU1, CPU2, LCD, and BMP indicate updated numbers.

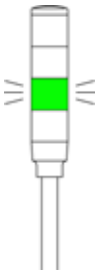
16.2. Color Lamp - State Diagram

Machine indicates the conditions by 4 colors lamp, red, yellow, green, and blue. Present condition of the machine is shown by the ON/OFF combination of these four colors.

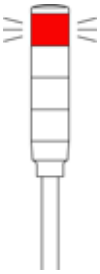
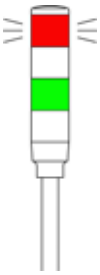
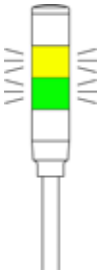
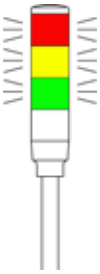


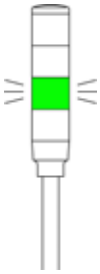
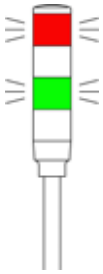
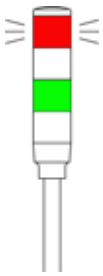
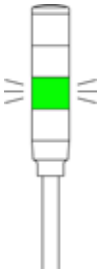
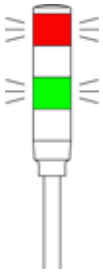
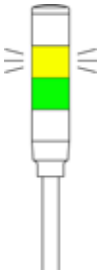
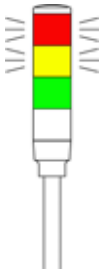
State of lamp:

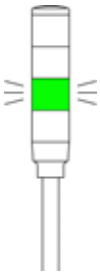
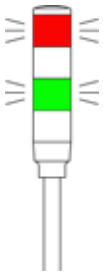
Lamp is ON



Lamp is blink

Process	State of color lamp (Normal state)	State of color lamp (At alarm)	Remarks
Rinse standby			Usual condition when power ON/OFF switch is turned ON
			ON: No color Blink: No color
Rinse process			Green lamp turns ON when rinse process begins.
			Blink: No color ON: Green
Dialysis preparation process (Include startup test)			Yellow and green lamps blink during startup test
			Blink: Yellow, Green ON: No color.

Process	State of color lamp		Remarks
	(Normal state)	(At alarm)	
Dialysis preparation End – Connection process			Green lamp blinks when mixture of dialysate begins.
			Blink: Green ON: No color
Dialysis process			Green lamp turns ON in the dialysis process.
			Blink: ON: Green
Dialysis process Sequential UF operation			Blue lamp turns ON in Sequential UF.
			Blink: No color ON: Green
Dialysis process bypass			Green blinks when flow to dialyser is bypassed by abnorma concentration, etc.
			Blink: Green ON: No color
Dialysis process at UF completion			Yellow lamp blinks when reached to the set UF volume. Yellow lamp changes to ON when the chime of the dialysis completion is muted with MUTE button.
			Blink: Yellow ON: Green

Process	State of color lamp		Remarks
	(Normal state)	(At alarm)	
Collection process			Green lamp blinks during the collection process and patient is disconnected. Blink: Green ON: No color

NOTE) The red lamp blinks when machine detects the alarm condition, and the lamp changes to ON when the alarm sound is muted by pressed MUTE button. However, the alarm resume and the red lamp blink if alarm condition was not dissolved within 2 minutes in the dialysis preparation process and the dialysis process.

16.3. Conversion Table (Pressure)

MPa	Kgf/cm2	mmHg		Kgf/cm2	MPa	mmHg
-0.10	-1.11972	-750.064		-1.0	-0.09807	-735.561
-0.09	-1.00774	-675.057		-0.9	-0.08826	-662.005
-0.08	-0.89577	-600.051		-0.8	-0.07845	-588.449
-0.07	-0.78380	-525.045		-0.7	-0.06865	-514.893
-0.06	-0.67183	-450.038		-0.6	-0.05884	-441.337
-0.05	-0.55986	-375.032		-0.5	-0.04903	-367.781
-0.04	-0.44789	-300.026		-0.4	-0.03923	-294.225
-0.03	-0.33592	-225.019		-0.3	-0.02942	-220.668
-0.02	-0.22394	-150.013		-0.2	-0.01961	-147.112
-0.01	-0.11197	-75.0064		-0.1	-0.00981	-73.5561
0	0	0		0	0	0
0.01	0.11197	75.0064		0.1	0.00981	73.5561
0.02	0.22394	150.013		0.2	0.01961	147.112
0.03	0.33592	225.019		0.3	0.02942	220.668
0.04	0.44789	300.026		0.4	0.03923	294.225
0.05	0.55986	375.032		0.5	0.04903	367.781
0.06	0.67183	450.038		0.6	0.05884	441.337
0.07	0.78380	525.045		0.7	0.06865	514.893
0.08	0.89577	600.051		0.8	0.07845	588.449
0.09	1.00775	675.057		0.9	0.08826	662.005
0.10	1.11972	750.064		1.0	0.09807	735.561
0.11	1.23169	825.070		1.1	0.10787	809.117
0.12	1.34366	900.077		1.2	0.11768	882.674
0.13	1.45563	975.083		1.3	0.12749	956.230
0.14	1.57603	1050.089		1.4	0.13729	1029.79
0.15	1.67957	1125.096		1.5	0.14710	1103.34
0.16	1.79155	1200.102		1.6	0.15691	1176.90
0.17	1.90352	1275.108		1.7	0.16671	1250.45
0.18	2.01549	1350.115		1.8	0.17652	1324.01
0.19	2.12746	1425.121		1.9	0.18633	1397.57
0.20	2.23943	1500.128		2.0	0.19613	1471.12

1.0000 Kgf/cm2 = 0.098067 MPa = 735.5613 mmHg
1.01972 Kgf/cm2 = 1.0000 MPa = 750.0064 mmHg

17 TERMINOLOGY

The following definitions will apply for the meaning of the terminology used in this manual.

1) **Dialysis:** Hemodialysis treatment in which substances are removed by diffusion
2) **Dialysate concentration:** The concentration of sodium electrolyte (unit: mEq/L) included in the dialysate is simply defined as the dialysate concentration. Also, the simple wording, "concentration" means the dialysate concentration if not specified for other meaning.
3) **Ultrafiltration (UF):** Method of treatment to remove excessive body fluid through dialyzer membrane.
4) **Sequential dialysis:** Operation to perform UF (ultrafiltration) without flowing dialysate.
5) **Double needle:** Method of treatment performed through bloodline with two fistula needles or catheter inserted in artery and vein independently
6) **Single needle (SN):** Method of treatment performed through bloodline with one fistula needle or catheter.
7) **Venous pressure:** Pressure in the venous side drip chamber. It is measured by connecting the venous pressure monitor line from the venous drip chamber of the bloodline to the venous pressure sensor of this machine. In a word, the pressure in the bloodline from the dialyzer outlet to a patient can be measured. This machine defines and displays this pressure as the venous pressure.
8) **Arterial pressure:** Pressure in the arterial side drip chamber. It is measured by connecting the arterial pressure monitor line from the arterial drip chamber of the bloodline to the arterial pressure sensor of this machine. In a word, the pressure in the bloodline from a patient to the dialyzer inlet can be measured. This machine defines and displays this value as the arterial pressure.
9) "**TMP":** Abbreviation of “Transmembrane Pressure”; Indicates the difference in pressure between the bloodline side and the dialysate line side. This machine simply uses the following method for calculation.

TMP= (Arterial pressure (PG4b) + Venous pressure (PG5))/2 –
(Dialysate inlet side pressure (PG2) + Dialysate outlet side pressure (PG3))/2 + OFFSET

When it has not the pressure sensor option, TMP is calculated as PG2 = PG3 and PG4b = PG5

10) **Dialysate:** Liquid to filter wastes from blood by using osmotic pressure.
11) **Bicarbonate:** Represents bicarbonate ion or carbonic acid ion. Dialysis method of using bicarbonate as the alkalization agent is called the bicarbonate dialysis.
12) **Acetate:** Represents acetic acid. Dialysis method of using acetic acid as the alkalization agent is called the acetate dialysis.
13) **Bloodline:** Represents the tube in which blood passes through the extracorporeal circulation.
14) **Dialyzer:** Medical equipment used for hemodialysis; Removal of body fluid and dialysis are performed through this dialyzer.

15) **Rinse process:** A process to pass water through and drain it from the dialysate line of the machine for a cleaning purpose.

16) **Disinfection process:** A process to disinfect the dialysate line by passing the appropriately-diluted disinfectant concentrate through and drain it from the dialysate line of this machine.

17) **Rinse program:** A function of the machine to complete the target rinse and disinfection processes automatically by presetting the pattern of the rinse and disinfection operation such as washing, disinfection, acetic acid rinsing, etc.

18) **Preparation:** A process to prepare for the dialysis operation of the machine getting ready for passing the dialysate after the rinse process is complete.

19) **Priming:** Filling the dialyzer and the bloodline before use with saline solution, etc.

20) **Bypass:** Short-circuit line for the dialysate, bypassing the dialyzer; Used to temporarily interrupt the dialysis treatment by switching to this line when the state of the dialysate becomes improper because of some reasons during the dialysis treatment.

21) **Closed system:** The chamber is filled with fresh dialysate first, and the dialysate is fed with the pump and returns to the room on the opposite side of the same chamber through the dialyzer. The whole hydraulic line in which the dialysate passes at this time is called the closed system.

22) **Blood pump:** A pump to give the blood flow, overcoming the internal resistance of the dialyzer and the extracorporeal circulation line.

23) **Syringe pump:** A pump to inject the anticoagulant agent into blood by pushing the syringe piston containing the agent at a preset speed.

24) **Bolus:** A function of the syringe pump to immediately inject the anticoagulant agent only of the preset volume.

25) **Conductivity sensor:** Measures the conductivity of the dialysate.

26) **Temperature sensor:** Measures the temperature of necessary sections in the dialysate line.

27) **Air bubble detector:** Detects the air bubbles in the venous side bloodline and prevents the air entry to a patient.

28) **Blood leak detector:** Detects the blood loss through dialyzer membrane by an optical method.

29) **Venous clamp:** Closes the venous bloodline to protect a patient when the machine detects unsafe condition on extracorporeal circuit.

30) **Grounding**: Taking ground. Earthing

31) **Disinfectant nozzle:** A nozzle to be inserted into the container of the cleaning solution or disinfectant to aspirate the concentrate in the rinse and disinfection processes.

32) **Technician:** A person who can operate, service, and repair this dialysis machine.